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[OFFICIAL CIRCULAR.]

ANNUAL MEETING WESTERN GAS ASSOCIATION.

SECRETARY'S OFFICE WESTERN GAS ASSOCIATION,
QUINCY, ILLS., March 20, 1885.

The Eighth Annual Meeting of the Western Gas Association will be held at Chicago, Ills., on the 13th, 14th and 15th days of May. The Committee of Arrangements, Messrs. E. L. Brown, P. T. Burtis, and Henry Pratt, have spared no pains to secure for our accommodation the best quarters for our purpose obtainable. Those who attended our last reunion at St. Louis will remember but too well that the chief, and perhaps the only, drawback to an entirely successful meeting was the character of the room in which were conducted the business sessions of our Association. Owing to our late unfortunate experience in this particular, you are all aware that it is a matter of the highest importance that the acoustic property of the hall in which we are to assemble should be as excellent as it is possible to secure. Bearing this point well in mind, the Committee, after having carefully examined the assembly rooms of every first-class hotel in Chicago, arrived at the unanimous conclusion that the Tremont House, of that city, came nearer meeting our requirements, in all essential particulars, than any of the others, and accordingly have secured it for our Eighth Annual Meeting. This hotel, although not so large as some of the others, is strictly first-class in all its appointments, and admirably well adapted to our needs. Liberal concessions from the regular rates were secured by the Committee, and the prices to our members will range from $2.50 per day upwards, according to the size and location of rooms. Apartments can be secured, at any time before the date of the meeting, by those who will communicate with the proprietors of the hotel, or with your Secretary; but the members must in all cases give notice, in their requests, of the rates which they desire to pay.

I am very anxious to be informed as soon as possible of the titles of the papers to be presented, and earnestly request their authors to favor me with this information at their earliest convenience.

Copies of our Constitution and By-Laws, blank forms of application for membership, or any other information that may be desired, will be promptly furnished if you will but make your wants known to, Yours very truly,

A. W. LITTLETON, Secretary.

Secretary Littleton has also mailed a copy of the following letter to each member whose name appears on the Association's rolls:

"I am very anxious that you should favor our Association with a paper on the occasion of its Eighth Annual Meeting, to be held at Chicago (Ills.) on the 13th, 14th and 15th days of May. Will you kindly do so?

"I am somewhat afraid that the presentation of papers may not be as generous as we all might wish; and am therefore specially desirous that you should contribute in this way to the prosperous issue of our meeting which will be, beyond question, entirely successful in all other respects. An early reply will be greatly esteemed."

ANNUAL MEETING OF THE GUILD OF GAS MANAGERS.

The Fifth Annual Meeting of the "Guild of Gas Managers," of New England, was held at 12 o'clock noon of Saturday, March 14, at the rooms of the Society, in Mason Building, Boston, Mass. The Secretary distributed to the members in attendance a copy of the tabulated statistics (compiled by direction of the Guild) for last six months of year 1884. He also read an arti-

cle, contained in columns of Boston *Medical and Surgical Journal*,* entitled, "The Dangers of Water Gas."

The Treasurer read his annual report, the document being devoted to a recital of receipts and expenditures for year 1884. When the statement of accounts had been duly audited, the report was accepted and ordered to be spread upon the Society's records.

With a view to enhance the interest in the monthly meetings, the Guild voted that two papers, upon subjects connected with the manufacture and distribution of gas, should be prepared and presented at each of the regular sessions of the Society. A special committee was appointed with instructions to make an assignment among the members as to the months in which the different gentlemen would be called upon for their papers. The President (after committee had reported) announced that the drawing had resulted in the following allotment:

April, Messrs. Humphreys and Cushing; May, Messrs. Rogers and Smith; June, Messrs. Slater and Spalding; July, Messrs. Bill and Perry; August, Messrs. L. P. Gerould and Richardson; September, Messrs. Rollins and Stedman; October, Messrs. Andrew and Leach; November, Messrs. Yorke and Tarbell; December, Messrs. Neal and Pratt; January, Messrs. Geo. D. Cabot and C. L. Gerould; February, Messrs. Prichard and Durfee; March, Messrs. Taber and Stiness.

The Guild then proceeded to an election of officers for ensuing year. The following named gentlemen were chosen:

President—A. B. Slater, of Providence, R. I.
Vice-President—R. B. Taber, of New Bedford, Mass.
Treasurer—Jno. Andrew, of Chelsea, Mass.
Secretary—E. G. Pratt, of North Attleboro, Mass.

After the remaining routine business had been transacted, the guests and members of the Guild partook of the annual banquet, covers for which had been laid, and the feast served, in the Society's rooms. A social hour or two was passed in a thoroughly enjoyable manner, and when adjournment took place the members separated with the mutually gratifying knowledge that the Guild meetings have resulted in a great improvement and addition to their fund of practical information. The best testimony to such advance is shown in the practical results gained at their several works.

The Guild now carries on its rolls the names of one honorary and twenty-five active members, and it is our pleasant necessity to chronicle its increased usefulness as evidenced with each added year of its history.

MESSRS. GIBBS AND VAN STEENBERGH TAKE A TRIP TO TROY, N. Y.

That eminent disciple of disinterestedness, Mr. L. S. Gibbs, whose latter-day travels have been directed to those localities where he can best alleviate "the woes and sufferings of a people who have been ground into the dust by the iron heel of the oppressor," which oppressor (iron heel and all) always takes the form, when crossing the field of vision enjoyed by Messrs. Gibbs and associates, of a gas company, has in due course of time arrived at the city of Troy, N. Y. That other eminently erratic traveler, for an account of whose mysterious peregrinations and their gruesome results the world is indebted (or not indebted, according to the impression of the reader), to the fanciful pen of Eugene Sue, is reported on one occasion as having sorrowed mightily over the direness and cruelty of the fate that hurried him on to bring dismay, disaster and death to the people of the gay French capital. Now one cannot help wondering whether Mr. Gibbs, ere he boldly marched on to the goodly city of Troy, tarried for a moment on the hilltop at its eastern confine in order that he might bemoan the sad necessity so relentlessly urging him forward in an endeavor to "smite" the property of the Troy and Citizens Gas Light Companies. While believing ourselves that Mr. Gibbs preferred the easier and simpler method of "running into Troy" while safely and comfortably ensconced in a "parlor car," and also think he would be much more sensible in following out that plan than should be the case did he spend an hour or two wandering or crooning about the hilltops on a day or night so cold as was the 18th of last March—Mr. Gibbs and associates appeared before the Troy Common Council on evening of March 18. He could bemoan himself just as well and just as completely on board the parlor car as did the Wandering Jew from the lofty eminence that afforded him a complete bird's-eye-view of Paris. And as Sue's hero extracted comfort from the fact that although through his entry was Paris to suffer great loss, yet after her suffering would come the knowledge that she had been "purified;" so also may we take it that Mr. G. solaced his perturbed mind with the reflection that the Troy Gas Company was reputed to be the possessor of a large surplus; and would not the stockholders be benefited if someone else succeeded in relieving them of the embarrassment and risk involved in the caring for "so much money."

Apart from the above problems, which, of course, Mr. Gibbs can alone authoritatively dispose of, it is matter of record that he, with B. Van Steenbergh and others, made application to Streets and Alleys Committee of Troy Common Council (March 18th) for a franchise to use the mains of defunct Troy Steam Heating Company as conduits for the distribution of a water gas, *a la* Van Steenbergh; also to lay extra conduits, and perform all the avocations belonging to a thoroughly (more or less) equipped gas plant. If these requests were granted the petitioners agreed to supply gas to consumers at a figure not exceeding $2 per thousand. Representatives from Troy and Citizens Companies were on hand to defend their interests, in the persons of Messrs. Sabbaton and Shields. Now, if we remember rightly, Gibbs' "man Friday" (Van Steenbergh) is the "engineer" who, on date of March 4th last, testified before the Senate Committee during one of the famous Morton House sessions, that he could manufacture an excellent article of illuminating (30-candle power) gas for 26 cents per 1,000 cubic feet. He also said that he had "just entered into a contract to put in a plant with a capacity of 350,000 cubic feet per day, for the sum of $180,000. There were to be ten miles of pipe, 1,000 meters, and two holders, each of a capacity of 175,000 cubic feet." He said the city in which he was to build the proposed plant had a population of 60,000, and that 31 cents per 1,000 would cover cost of distribution. Putting these statements together, and bearing in mind that Troy has about the stated number of inhabitants, it looks as though Van's contract had reference to the home of the Trojans. But as "the best laid plans of mice and men gang aft aglee," it might be just possible, in view of the fact that the Troy Council has not yet sanctioned the scheme, that Mr. Van's contract, so glibly spoken of as already made at a date as early as March 4th, might hereafter be chronicled as having "gang aft."

In the argument that ensued before Committee Mr. Sabbaton read a letter, which he had received from the Superintendent of the Chuctanunda (Amsterdam, N. Y.) Gas Light Company, in regard to his experience with Van Steenbergh and his process. The Amsterdam Company allowed the "inventor" to put in his system, and Mr. Ward asserted that it was a most complete and thorough failure. Quoting Mr. Ward's own words, he concluded his letter to Mr. Sabbaton with the statement, "They were to make, with each generator, 5,000 feet per hour of 24-candle gas, with a consumption of 5 gallons of naphtha and 50 lbs. of coal. They could but make 4,000 feet with two generators; and that product was only obtained at an expenditure of 10 gallons of naphtha and 300 lbs. of coal." Amsterdam had enough of the experiment, and Van's traps were relegated to the seclusion which the Goshen Foundry (Mr. V.'s manufacturing center) "grants." As it was at Amsterdam so is it likely to be at Troy. Having (up to time of writing) received no further details of Committee's action it is fair to presume that Mr. Gibbs' project still "hangs fire." We would request of Mr. Sabbaton that he keep us informed as to the progress made concerning the latest attempt at the "siege of Troy."

SYRACUSE (N. Y.) GAS COMPANY REDUCES PRICE OF GAS.—Brother Wood's company keeps moving right along. On Friday, March 27th, Secretary Babcock was authorized by his board of directors to announce that from and after June 1st the price of gas would be reduced to $1.60 per 1,000. All of which means cheap gas, good management, and skilful engineering.

The Market for Gas Securities.

Consolidated gas has experienced a continued spell of depression during last fortnight, and there undoubtedly has been much manipulation indulged in. At time of writing (morning, March 31,) the stock is offered at 84, best bid price being 83¼. The total sales, since our last report was given, foot up 6,914 shares at figures varying between limits of 92¼ to 84. The Senate Committee appointed to "investigate" the New York city gas companies handed in a report, together with a draft of the legislation proposed, on the evening of March 30th. It was not to be supposed, judging from the *personnel* of the Committee, and making due note of the parties who appeared to be in charge of the Morton House *seances*, that the scheme or arrangement whereby consumer and company were to be alike protected would be of any value, or savor in any respect of fairness. The synopsis of bill, as presented in morning papers, bears out such suppositions; and probably the most noteworthy feature of the plan is the charmingly liberal manner in which the funds of the Consolidated Company are to be distributed amongst the lucky politicians, who will, if the scheme goes through, secure a berth on the "Board of Lighting Commissioners," or even a Secretaryship to that august body. Three Commissioners are provided for, each to be reimbursed in the annual sum of $6,000, and the Secretary is to draw the modest stipend of $3,000—"lame ducks" will not have much chance in that "hunt." The "specifications" limit the annual expenses, etc., of Commission to $40,000. Extended comment is reserved until certified copy of bill comes to hand. Equitable is very strong, 63 shares, sold at auction, brought 107½. The company is building a new holder.

On March 24th articles incorporating the Chesapeake Gas Company were filed at Baltimore, Md. Among the directors we note the names of Messrs. Tag, Dickerson, Benedict, and Jerzmanowski, all connected with Equitable (N. Y.) Company. Consolidated stock, in consequence, dropped 27 points—or from 79 to 52—in just ten days. Certain New York parties, who are on the inside, made large profits on the "short" side. In old times another word than "profits" would be employed to designate the transaction. For regular list see page 188.

* See page 177, current issue.

[Official Report—Continued from Page 147.]

Fifteenth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Mass., Feb. 18 and 19, 1885.

First Day—Afternoon Session—Feb. 18.

President Greenough announced the regular order to be the presentation of papers, and called upon Mr. C. F. Prichard, of Lynn, Mass., to read his communication entitled,

THE INFLUENCE OF STEAM IN THE ASHPAN.

In accordance with the invitation, Mr. Prichard read as follows:

One of the chief advantages usually claimed for the use of steam under the grate bars, or what is substantially the same thing, water in the ashpan, is economy of heat; and hence of fuel. The ground here taken is that instead of their being any economy the reverse is true; and a positive waste of heat, and consequently of fuel, results.

When a body enters a fire at a certain temperature, and leaves the chimney at a higher temperature, it has evidently obtained its increased temperature from the fire, and has accordingly occasioned a loss of heat, and consequently a waste of fuel.

When the nitrogen of the air enters a fire and passes from the chimney in the same condition as when it entered, except that it has attained a higher temperature, heat is lost; but it is unavoidable. If steam of 212° enters the fire and leaves the chimney at 600 to 1,500° temperature, it has obviously withdrawn heat from the furnace. The fact that it has decomposed and recombined has nothing to do with the loss of heat. For the purpose of calculation it is the same steam that entered the bars; and it has increased in temperature just as the nitrogen did; but, perhaps, the waste thus caused is not justifiable.

A simple experiment makes this waste visible—if you have short chimneys, give a vigorous shake to the bars over an ashpan full of water; in a moment a column of flame is produced, shooting up far above the chimney top. No one supposes for an instant that this simple action has increased the heat of the furnace; it has, only for the time, transferred the combustion which should take place in the furnace to the chimney top. So a small amount of steam is continually transferring combustion from the furnace to a point further on where it is not so much needed, while the unnecessary gases thus introduced are continually drawing heat from the furnace and delivering it to the outside air. In an experiment lasting some time it was found impossible to produce any flame on the chimney top, when there was no water in the ashpan, while the fire was very white and next to impossible to face; the heat on the retorts was as good and perhaps better, while the amount of fuel was noticeably less, and the bars and bearing bars suffered no deterioration that we could notice. The clinker, however, showed a decided increase, but was very soft and inclined to run. A deposit of clinker from a tar fire, which had defied all efforts to remove, softened and was taken out easily. In running the ordinary way this bench used up from 650 to 750 lbs. of water each 24 hours, and the amount of heat passed out of the chimney, exclusive of that which entered with the steam, was not far from 2 per cent. of the total heat produced in the furnace.

If an evaporation of one pound of water for each pound of fuel is reached, and the fact considered that much of the water carried in must inevitably be carried in as mechanically suspended particles, which absorb the latent heat of steam, as well as that due to the increase of temperature, it is not impossible that there is a waste of fuel amounting to nearly four per cent.

The increase in the products would amount to nearly 15 per cent., and would be no slight drawback to a bench whose flues are perhaps already overcrowded.

Whether there is an increase of temperature actually obtained is a matter which will admit of considerable discussion. It is sometimes erroneously argued that when steam is admitted to a fire, and decomposed into its elements, hydrogen and oxygen, the oxygen would unite with the carbon of the fuel, and make it possible to do with a smaller supply of air, thus reducing the amount of heat-absorbing nitrogen and making it possible to obtain a higher temperature. Unfortunately for this reasoning the hydrogen, the remaining element of the decomposition, has been neglected; and, in the nature of things, must be consumed to the original amount of water by combining with oxygen, and having no source for O but the air, it becomes necessary to introduce just as much air to supply this O as was spared before. Thus no permanent reduction of the air supply is effected; and consequently no economy from the reduction of nitrogen. In fact the reverse is true, since a certain amount of heat is lost in every change of form which a body undergoes, and since the combustion of every particle of H cannot be expected in practical working, unless there is a large excess of air supplied.

Sometimes it is argued that the steam of itself carries heat to the furnace to its advantage. It is but few years since that a scientific gentleman attempted, in the columns of the American Gas Light Journal, to demonstrate perpetual motion, in a chemical form, by claiming a gain of heat; because the dissociated hydrogen and oxygen formed new chemical compounds with the carbon of the furnace, whose combustion increased the total heat. Rankine, Tyndall, Maxwell and others make the statement, in various forms, that when H and O are present in the fuel, in the proportions to form water, they unite as such, and do not increase the total heat of combustion. From such testimony it must be admitted that no surplus heat can be expected from the decomposition and recombination of the steam; while, as seen before, although the steam carries into the furnace 212 heat units due to its temperature, and 966 due to its latent heat, for each pound of water, yet it also carries out of the furnace from 600 to 1,500 heat units due to temperature, plus 966 due to latent heat.

Statements are often made that the hydrogen flame is the most intense flame; and a well-known treatise states that the decomposition of steam produces hydrogen, a combustible of the highest order, and oxygen, a supporter of combustion, leaving us to infer that by the simple introduction of H a gain in intensity was made, while a still further gain resulted from the oxygen thus produced. We have already seen how much benefit can be expected from the O, since it does not reduce the supply of air, while the former, we contend, is not right—H not being hotter than carbonic oxide produced in regenerative furnaces, burdened as it is with the unnecessary, but unavoidable, N of primary combustion, while it is several hundred degrees cooler than the flame of pure carbonic oxide. The statement that H flame temperature is lower than CO conflicts with many authorities who cite H as the hotter; but if one cares to make the calculation, let him bear in mind that the total heat of combustion of H is not developed in the flame, for the 9 lbs. of water resulting from the combustion carries away 966 heat units, its latent heat, for every pound, which must be deducted in all calculations of flame temperature.

In the furnace, however, a different order of things exists. There the CO is burdened with the necessity of heating up the N of primary combustion, spreading its heat over a larger volume, and reducing its intensity. While the H, passing into the furnace as steam of 212°, and carrying 966 units latent heat, starts its combustion from a higher level than ordinary H, and reaches a higher temperature.

So we say that the superiority of H over CO in our furnaces is not due to the high flame temperature of H, as so many state; but rather from burning H, already partially heated up, as against CO adulterated with N. Were this radiant heat from the under part of the fire caught by the entering supply of air, and thus returned to the fire, the result would be as good, while the waste of heat already pointed out would be avoided.

Although it seems possible that, theoretically, an increase of temperature may result from this reasoning, there are other things to be considered. Steam is introduced below boilers to cause a long flame, and to give each tube an opportunity to do its share in transmitting heat to the water, by prolonging the combustion. This is departing from the instructions of Tyndall, who directs us to concentrate to obtain intensity. And as time and space are prime factors in obtaining intensity, can we expect that one pound of H, occupying 188 cubic feet of space, can compete with one pound of CO occupying but 13 feet? The increase in the products of combustion, the waste of heat already shown, and the effect of dissociation, about which so little is known, all combine to reduce this theoretical difference of a few hundred degrees, until it is doubtful if, in practice, any gain of intensity is produced by the use of steam.

The saving of the bars is claimed as a minor matter, but it is of slight importance; and within a month an English patent, in one of its claims, proposes to preserve the grates by keeping them away from contact with the steam.

The prevention of clinker is a matter of more importance. This is to be brought about by the reduction of the intensity of the fire, which causes the clinker to fuse. Whether we are justified in reducing the intensity of the ordinary furnace by causing a waste of fuel is a debatable question. In a regenerative furnace, where it would seem the combustion might be controlled by other means, water is often used to reduce intensity, while the primary air is often heated to promote intensity.

On motion of Mr. Thomas, a vote of thanks was tendered to Mr. Prichard.

Discussion.

The President—We have heard a most interesting paper, and it is one of the sort that we like to have presented at our meetings, since it runs somewhat counter to generally accepted views. Considering that so many of us have been working on the problem of how to get steam into the furnaces, I think Mr. Prichard's arguments should provoke a lively discussion. I would like to hear from Mr. Stedman on the subject.

Mr. Stedman—We have used considerable steam in our regenerator fur-

naces, not with an idea that we were thereby increasing the total yield of heat from the fuel, but simply that we might transfer the heat from a point where it was only destructive to a point where it was beneficial. At the close of Mr. Prichard's paper he calls attention to the fact that those using regenerator furnaces introduce steam to control the intensity of the combustion, and heat the primary air for the purpose of increasing the intensity of the combustion. Those two operations carried on together seem almost paradoxical; but at the same time I can see why there is a pretty good reason in doing the two things together. I think the gentleman is perfectly right in his statement that there is no increase of temperature, but on the contrary, rather a slight loss of fuel occasioned by the introduction of the steam. As he states, the transference of energy from one point to another is generally accompanied with more or less loss; and the decomposition and recomposition of the same elements are undoubtedly accompanied with some loss of energy. As we have sometimes in our experiments evaporated somewhere near a pound of water to a pound of coke in the furnace, we imagine that the oxygen from the steam does really enable us to use a less quantity of primary air. We heat that primary air for the purpose of promoting the energy of the fire and aiding in the decomposition of the steam, and so that we can decompose as much steam as is necessary to effect our object without tearing the furnace to pieces by the great destructiveness of the heat at the point of greatest energy. Just here I have a good mind to bring in my old illustration of a zone of intensity which I believe our friend from Brooklyn criticised a few years ago. There is a zone, or area, of intense combustion, about a foot above the furnace bars; and there is the point where I think everybody who has used regenerator furnaces has mostly found difficulty with clinkers. Above that the heat is maintained at a moderate temperature, owing to the fact that the decomposition of the carbonic acid which is formed at the intense point is a reducing process, and reduces the intensity of the heat above that zone. I cannot say, from my experience, that much loss of energy would be due to the fact that we decompose the steam. I am very well aware we could get up a much more intense fire without the steam; but the question is still debatable whether it pays to do it, or whether, on the whole, it is better to save a small amount of fuel, and be subject to the destruction of grate bars and the annoyance of clinkers, or to use a little more fuel for combustion and control the energy at the point where it is most destructive, and then transfer that energy to where it is more useful. I might have said, in connection with other annoyances of intense heat, that at certain points it wears through the lining of the furnace pretty rapidly. Of course, when the steam is decomposed we get as a product the free oxygen and carbonic oxide due to the association of the oxygen of the steam with the carbon. The gentleman is perfectly right in assuming that we do not save in the total bulk of nitrogen, because we have to re-supply oxygen to the hydrogen to effect the combustion; and of course the carbonic oxide from a pound of steam necessitates just as much air to consume it as the carbonic oxide made from the air originally. The point is, I think, to determine whether, on the whole, the loss of energy (which the gentleman admits is slight) is enough to warrant us in dispensing with the steam, using a more intense heat throughout the whole body of the coke. I am under the impression that the control of energy at the point of greatest combustion diminishes the amount of carbonic acid produced by the fire, so that there will be a greater proportion of resulting gases which will be combustible. I may not be right about it, but I think perhaps that is one of the results. As to the loss of heat from the mechanically suspended particles of water which may come in with the steam, but which have not in them the developed latent heat of steam—I think that is a fallacy, because in our furnace, where the primary air comes in with considerable elevation of temperature, it is sometimes a little above the normal temperature of steam. Thus the latter, instead of being decomposed, or having any contained watery particles, is a genuine steam, having all the heat of steam, together with all the latent heat which has been produced by the evaporation of the water. When we look through the front door of the furnace without letting in any air (as we can do by removing a slide and putting in a piece of glass), it is almost impossible to perceive any steam. The moment the door is opened, however, the particles of moisture are condensed, and the steam becomes visible. I suppose it would be a matter of calculation as to whether the specific heat of steam in its relation to the specific heat of air—of nitrogen particularly—would be any disadvantage as to the bulk, as the bulk of gases in the furnace, after complete combustion, would be a little greater by using the steam than by the use of air alone. In that respect the result might figure out a trifle less on account of additional bulk which would have to be raised to the temperature of the furnace. In regard to the hydrogen (as we do not claim any result from that, other than that there is no loss, theoretically, from the decomposition and reburning of the hydrogen above) it is hardly worth while to consider it, except in respect to its bulk, and the intensity of the volume of combustion. The loss of 966 units of heat in a pound of water would be comparatively small, when we consider that the combustion of a pound of hydrogen yields 62,000 heat units. I am rather doubtful as to the suggestion that the radiant heat from the bottom of the fire (in case the steam was withdrawn altogether) could be utilized in heating the incoming air, since the radiant heat is transmitted through the pure air without having any effect upon it. It is only upon coming in contact with a body previously heated that the air is heated; or it is heated slightly by radiant heat, after coming in contact with the impurities in the air, and which are suspended as solid substances. There was suggested the idea of controlling the intensity of the energy of combustion by other means. I suppose if we could build a furnace large enough we could so control the introduction of air as to have a proper quantity diffused over a very large surface, or so that the energy of combustion, at any particular point, could be very much reduced—possibly reduced to that point where clinker would be of very little consequence. If it were possible to get furnaces large enough to get such a result, and to obtain a supply of air without the addition of steam, I confess I should be rather inclined to believe that that would be a superior furnace. It is hardly possible, in an ordinary stack, to build furnaces of that size, especially if you have to put in recuperative work with it. The more I see of the effects of recuperation the more I am inclined to believe that it is worth all it costs in its economy of fuel, in the energy of combustion which results, and in the high heats which can be produced therefrom. I do not know of any other point that I can make a note of. I do not see but that generally the gentleman's position is a sound one, and I am not inclined to cavil at it; but I think it is a debatable question (and one I would like to hear more about) as to whether the slight loss of energy (for it must be very slight) in using steam under the bars of regenerative furnaces is important. I am not now speaking of the effect of its use in ordinary furnaces, since the resulting gases from ordinary furnaces are almost in a complete state of combustion—in fact I may say that they are complete—because in ordinary furnaces we use probably two volumes of air for every one required, and such use is necessary in order to produce carbonic oxide and not have carbonic acid. In the regenerative furnace I confess I do not see how we can reduce the energy of combustion to a point where it is practically harmless on the walls of the furnace, and where it results in reducing the amount of clinker without the use of steam, without making the furnace very large indeed. I am inclined to think, on the whole, from our practice, that steam has been very advantageous. We have run our furnaces sometimes three weeks, sometimes a month, without clinkering at all, other than to shake the bars once in four or six hours; and from time to time run a bar into the fire. No clinker accumulates, other than that which can be shaken down through the bars. After a time, depending upon the driving of the fire, and the kind of fuel used in it, the clinkers accumulate on the bars to that degree that it is desirable to take the bars out and let the clinker which accumulates on them fall down into the ashpan, as it cannot fall out between the bars. On the whole I am very well satisfied with the result of using steam, both in the ease with which the furnaces are managed, and as to the fuel account, which with us has been reasonably small.

Mr. Prichard—I think the amount of mechanically suspended water carried from an ashpan full of water is overlooked. Considering the small distance between the water and the bars, and the rush of entering air and steam, one-half the amount evaporated must be carried into the fire in the shape of mechanically suspended particles. It seems to me it would not have time to reach the state of steam. Col. Stedman made a statement with regard to the amount of latent heat deducted from one pound of hydrogen. The hydrogen furnishes 62,000 heat units, and he deducts the latent heat of one pound of water; but in fact there are nine pounds of water formed from one pound of hydrogen, and you must multiply 960 by 9, which makes very nearly 9,000 heat units to be deducted from the total heat which should result from one pound of hydrogen; and reduces the flame temperature of the hydrogen from 5,700 degrees, as given by Haswell and others, to a temperature, as I calculate it, of 4,800 degrees. The fact that there is nine pounds of water there instead of one is a fact very often overlooked in the calculations. We speak of the slight bulk of the steam if we succeed in evaporating one pound of water with one pound of fuel; but instead of its being slight, it amounts to nearly 15 per cent. of the bulk of the products of combustion. I have often thought that the introduction of water under a regenerative furnace was perhaps a needless waste; for we know, from the results of the water gas people, who run a blast under the regenerator, that they do produce a vast amount of carbonic oxide with a comparatively small amount of clinker.

The President—I hope this discussion will not stop here. The question before the meeting is a practical one, notwithstanding the theories which have been advanced. Narrowed down, the real question is, "What is the effect of putting steam in regenerative furnaces?" I think, in so far as that is concerned, we have had some experience which leads us to agree with Col. Stedman rather than with Mr. Prichard. Last year we imported from Germany some settings of eights, with what are called open hearth furnaces—these having no grate bars in them. The coke ran right down into the bottom. I found, as matter of fact, that we could not keep the furnace from

clinkering up on the middle unless we put steam into it. When we used steam we found we could run the thing perfectly well; but without the employment of something to cool the "zone of intensity" we got a clinker deposit in the middle that took all the intensity out of the heat in the arch, and we have been obliged to run steam in underneath, in small quantities, ever since. In respect to those furnaces which we are running at Commercial Point, I want to call your attention to the analyses. We found out there just what others have found out elsewhere. In putting steam into the water of the ashpan we caused a large quantity of steam to be evolved. The practice has greatly lessened the quantity of labor required in clinkering, and it has kept the furnaces cool. I have no doubt a certain quantity of heat is theoretically lost; and if you decompose steam in the first place, and then burn it up afterwards, you do not get back all that you start with; but, as matter of fact, you take heat out of the furnace and put it somewhere else where you want it a great deal more than in the furnace. I think it is the experience of most people who have handled regenerative systems that they are willing to occasionally dispense with a little heat in their furnaces, and would be glad if they could control their heat rather than increase it. As far as the effect of water on the grate bars goes—if water under the furnace or in the ashpan does not do any good to grate bars, then I do not know what it is there for. I would be glad to have some gentleman, who is a more practical gas maker than I am, say something about that thing. I always supposed it was a necessary part of the fitting out of gas works that you should have an ashpan containing water underneath the grate bars; and that it was necessary to have water there in order that the grate bars might be kept cool. Now we are told that there is no necessity for the water there; that the bars are better without it. I hope the Association will not permit such contradiction of an ordinary custom to pass unchallenged.

Mr. Armington—I have listened carefully to the reading of the paper, and I heard a statement made by which I understand the author to claim a loss of 2 per cent. of all the heat for each 4 per cent. of fuel consumed. It strikes me that that must be radically wrong. Perhaps I have misunderstood him. It seems to me we must be getting very little result from the amount of carbon we are burning, when we lose 2 per cent. of heat for each 4 per cent. of fuel burned.

Mr. Prichard—You have got two statements confounded. I said, if you evaporated a pound of water for every pound of fuel, and admitted that one-half of the water went in as mechanically suspended particles, you lose nearly 4 per cent. of all the heat produced. Two per cent. did not come in any connection with the 4 per cent. I said that in an experiment, running in the ordinary way, a bench used up from 650 to 750 pounds of water each 24 hours; and that the amount of heat which passed out of the chimney, exclusive of that which entered with the steam, was not far from 2 per cent. of the total heat produced in the furnace.

Mr. Armington—In the next paragraph you speak of 4 per cent.

Mr. Prichard—I said, "If an evaporation of one pound of water for each pound of fuel is reached, and the fact considered that much of the water carried in must invariably be carried in as mechanically suspended particles, which absorb the latent heat of steam as well as that due to the increase of temperature, it is not impossible that there is a waste of fuel amounting to nearly 4 per cent."

Mr. Armington—I confess I do not precisely see that yet. I shall have to take the paper and read it through carefully. It seems to me that the one paragraph qualifies the other.

Mr. Prichard—One relates to an ordinary furnace, and the other relates to a furnace evaporating one pound of water to one pound of fuel.

The President—That is a pretty large evaporation. Do you mean to have these remarks in your paper apply to ordinary furnaces chiefly?

Mr. Prichard—Chiefly to ordinary furnaces.

Mr. Armington—I ought to say further, in connection with this paper, I think myself there is a great deal to be learned with regard to the management of these furnaces. A short while ago, in talking with a very intelligent German, he made me quite angry with myself to think that we had totally lost sight of one important fact in combustion, but still one they had been applying in that country for thirty years. It was in regard to what is termed the drop-flue boiler. When we began to economize fuel, in respect to the making of steam, we were taking our heat, in the first place, and putting it through the large flues of the boiler, letting it then gradually ascend the flues until it discharged into the smokestack. After a while we became convinced there was a waste of heat in this practice to which we should not be subjected. From this we started out with what has since become known as the drop-flue boiler, or one in which the flame passes directly from the furnace into the back connection, rises at once to the top, and from thence is gradually forced down through each tube, being finally taken out at the bottom. We have entirely lost sight of that principle in heating retorts. Until very lately, as you quite well know, we have built our chimneys right on top of our benches; have allowed the heat to ascend and pass right out, without paying any attention to it. If we had at that time adopted the plan of heating retorts as we heat boilers, our fuel account would have cost us much less than it did. I think it is the duty of every man who is heating a bench of retorts (if he cannot get along in any other way) to try the drop-flue principle by closing in his damper, so that when the sight-hole is opened the flame will just appear there, showing there is pressure at that point. Applying the principle to regenerative furnaces, you will be sure that your combustion is perfect, because there is no imperfectly consumed carbon which would otherwise pass out into the flues. As far as this paper is concerned, I think it is a very valuable one, and I believe that any engineer who has tried this experiment should pass an hour or two in carefully reading the paper and making notes upon it. I hope we shall have the paper published in full.

The President—It has been suggested to me that Mr. Nettleton has made some experiments with regard to steam. Is that so?

Mr. Nettleton—For the past year I have been using steam under the grate bars in addition to that evaporated from the water in the ashpan, and have found it a very decided advantage. The clinker produced now is very much less in quantity than before the steam was used; and what there is is very easily removed. The furnace walls burn away much more slowly; also, the labor of clinkering is very much lessened. Where formerly the grate bars were driven four times in 24 hours, and the furnace clinkered, now they are never driven; and instead the grate bars are shaken four times every day, and once in nine or ten weeks the furnace is entirely emptied, and the clinker broken down on top. The saving in iron for supplemental grate bars alone amounts with me to fully two tons a year, and that with but three benches in use in winter and two in summer.

Mr. Armington—If we take this paper as literally true, what our friend Nettleton says he does is to save a certain amount of iron which he used for grate bars—in so doing used from 2 to 4 per cent. of fuel which escaped up the chimney. Now which is the more valuable—the grate bars that he saves or the fuel that he uses?

Mr. Nettleton—I may add that since using steam I am making 75 to 100 feet more of gas per bushel of coke consumed in the furnace than I did before.

Mr. Prichard—It is hardly fair to attribute that to steam. That benefit comes from the better running of the furnace which he is using, and not from the steam alone. Perhaps if he did not use steam he could do better still. If he devised a sort of furnace by which he could do away with the use of steam entirely, and heat by the air admitted, he might claim that saving and 2 to 4 per cent. additional.

Mr. Nettleton—I presume that, theoretically, I could save some fuel by not using steam; practically, I am sure I could not. Occasionally in some furnace the steam is shut off—perhaps through the carelessness of the men—and immediately the furnace commences to clinker; and with me the formation of clinker means the destruction of the furnace. I am confident I could not hope to make a furnace last so long without steam as I can with it.

Mr. Sherman—What kind of furnace is Mr. Nettleton using?

Mr. Nettleton—It is the Dieterich furnace, enlarged. The original Dieterich furnace was 14 by 36 inches, and 3 feet deep. Those that I am now using are 24 by 36 inches, and 5 feet deep.

Mr. Sherman—Other members are using Dieterich furnaces; we would like to hear what they are doing.

The President—I think we can learn something about it from Mr. Stiness.

Mr. Stiness—I can say that my experience with the Dieterich furnace, in regard to burning up the grate bars, was not to the extent recounted by Mr. Nettleton, although in our practice we decompose a great deal of water in the ashpan. When we drive the secondary grate bars (twice in 24 hours) we have never experienced any very great trouble with clinker. Acting under the advice of Col. Stedman, I tried the experiment with steam in a crude way; but it did not give me the benefit I expected to derive, nor the benefit which my adviser derives from the peculiar way he uses steam in his furnaces. While I did not obtain any marked advantage from the manner in which I used the steam, still, while I did use it, it decreased the intensity of the flame at the very point of combustion. There are benefits to be derived from the use of a regenerative furnace, independent of the item of expense of grate bars. I do not think I have used more than a ton's weight of them in a year and a half; but still there is that trouble in regard to the burning up of the secondary grate bars. We use water in the ashpan, and I think I have to-day the same lower grate bars (those directly above the ashpan) that I had when we started the furnace—a year ago last August. It is only the secondary grate bars which are a source of expense. At the time that I used the steam we were not troubled with clinker at all; but in my experiments I found that the benefits to be derived by the intense heat which I could obtain in carbonizing the amount of coal which I could work off in the retorts, more than compensated for the expense of the secondary grate bars. I believe that Mr. Prichard is correct when his remarks are applied to the common furnace; but I do believe that if he were to ex-

periment with a regenerative furnace—either with the Stedman or the Dieterich—he would change some of his ideas with regard to using steam as a means of increasing the heat and the products of combustion. I have two furnaces now on the Dieterich plan, which have been in constant daily use for eighteen months; and were it not for the retorts in the benches which I must let down with the coming spring, I think they would continue for two years. I am ready to say that from the time the benches started for every day in the year and a half (not counting the missed charges, nor, in fact, any of the "outs" that you may name which are common and constant in gas works) that I have been able to produce over 9,000 cubic feet of gas per retort; and I consider the accruing benefits gained by use of the regenerative furnace will more than compensate for the extra expense of grate bar renewals.

Mr. Nettleton—Can we not hear from Mr. Wood, of Syracuse?

The President—Mr. Wood, we would like to hear from you.

Mr. Wood—I have paid but little attention to the theory of the matter which is the subject of this paper. At our works they do not give us much time for theorizing. Reverting to the common furnace, and to the dispensing with water in the ashpan, my opinion is that such practice is of very great benefit, and that we gain in fuel instead of losing it. The reader of the paper illustrates his argument by stating that shaking up the grate bars and thus depositing the hot ashes in the ashpan, causes a large volume of flame to issue from the chimney. That is always the case, and is but an indication that the momentary heat and fire is beyond the chimney capacity for carrying it off for the time being. If the experimenter will examine among his retorts, or in the fire-place at the same time, he will find very large and great increase of heat. In the ordinary furnace I think he will find it almost utterly impossible to keep up his heat without the presence of the water. From observation it would seem as if that water were decomposed and turned into hydrogen, or water gas, and consumed in the more intense heat in upper part of furnace. I do not agree with him that there can be a loss, but believe there is an actual gain. So far as regenerative furnaces are concerned, we have had but little experience with them. We have used the Stedman furnace for about two months, and I must say that the results thus far are satisfactory. We have had no destruction of grate bars, nor of the furnace; but very little clinker has accumulated; we have had only to clinker the furnace once in three or four weeks. Running it on a four weeks stretch we have found a trifling collection of clinker at about a foot above grate bars; but the accumulation was so soft that it could be easily dislodged. Clinkering once in three weeks we find little, if any, trouble from the accumulation above mentioned. The weight of water evaporated, according to the statement made by Mr. Stedman, when on his December visit to Syracuse, was about the quantity he has here mentioned—about one pound of water to the pound of fuel burned. This evaporation figure I give from memory. It appears that, upon introduction of the steam at the place noted, it is decomposed and does act somewhat towards reduction of heat intensity at zone of greatest combustion; but, then, if I may so say, having been converted into water gas, it is immediately consumed beneath upper portion of a body of intensely heated fuel, and a large addition to working heats is thereby gained. From a practical point of view, that desirable result appears to be secured. I think gentlemen who are operating with even common furnaces would be justified in asserting that there is actually a gain by burning this water gas in that way. I think it is the best way to use water gas. (Applause.)

The President—Mr. Slater, in your absence from the room the Association has debated the question of steam in furnaces, the effect of steam upon grate bars, and upon the heat produced. I think the Association would be glad to hear what has been your experience in these matters.

Mr. Slater—We have not used steam in our furnaces at all. We do use water in the ashpan.

[To be continued.]

[Official Report.]

Papers Read before the First Annual Meeting of the Ohio Gas Light Association, with Discussions on Same.

First Day—Wednesday, Feb. 18.—Morning Session.

The first paper read was presented by Mr. Jos. Bate, of Tiffin, Ohio. It was entitled:

The Use of Gas Stoves as a Means of Increasing the Consumption of Gas.

The author read as follows:

In response to the request of the Executive Committee, that I prepare a short paper on some subject, I have endeavored to show in the following lines how gas and gas stoves should be managed in order to best produce the result which is the subject of this paper.

It is within my remembrance as a gas man that gas stoves were considered a great novelty. Now there is no question but that they are an actual necessity in almost every household. Of course their use is limited to those people living close to lines of gas mains; and it is the duty of every live gas superintendent to see that all those within the reach of gas have their attention called to the fact that gas is the cheapest and best fuel to use for cooking; and further, under certain circumstances, it can be used economically for heating.

This latter is the hardest point to prove, and can only be done where the gas companies are willing to sell gas for the lowest figure commensurate with a little profit. To introduce gas as a fuel the companies must proceed in an energetic and practical manner. Theory will not do here. The Superintendent is the man who should have this particular branch of gas distribution under his special control. He is the one who stands between the company and its consumers. He is the one (in small towns at least) whom everybody knows. He is looked upon as the authority in all matters pertaining to a supply of light, and (in this case) heat.

The consumer seldom comes in contact with the company, and to successfully introduce and push the use of gas as fuel the Superintendent should be a man of fair business address, and vested with full power to make rates according to the necessities of the case in hand. He should have the power to procure the best quality of stoves, and should take care to thoroughly test each style and make of gas stove in the market. Care should be taken to select stoves that are not only durable in material but tasteful in design; stoves should not be purchased at random. The various styles of burners should be carefully examined. The ovens should be especially looked after, as to proper size and capacity for retaining heat, and should be the most economical in consumption of gas. I am not advertising any make of stove; but there is a material difference in the various sorts now made and offered to gas companies. Having decided which is the best sort of stove (and there are several kinds equally good, though differing somewhat in style), the Superintendent should next exercise a little judgment as to those of his customers he shall first approach on the subject. He must be able to prove to them that a gas stove has a much larger capacity for cooking, and takes up less floor space, than the ordinary coal, wood, or gasoline stove. If a reasonable price can be fixed for gas, the Superintendent can safely assure his customer that it is cheaper than coal or wood; much cleaner, more easily managed, and "altogether lovely, and not likely to fade away." As to a comparison in cost of running against a gasoline stove, he may find himself at fault, if he assert gas is the cheapest simply in dollars and cents; but the difference in safety, cleanliness and smell, more than makes up for the slight difference in cost. Having made this impression on the mind of the average housekeeper, he must next be able and willing to set up the stove, in a convenient position, at the least possible cost for fitting.

This latter must always be done by the gas company at about net cost. It will never do to intrust this matter to the resident gas fitters doing business independently of the company. The work must be done neatly, and in such manner that leakage is next to impossible. The connection immediately at the stove must be a nice piece of lead pipe of sufficient length to enable the housekeeper to move the stove enough to get at the floor underneath when desirable. Care should be taken to have this lead connection of such size as will admit a full and free supply of gas to the stove—¾-inch to 1-inch pipe will answer for a good-sized stove, or one such as will do the cooking for a family of 20 people. A "No. 9 Economy" stove, or "No. 8 B, Goodwin" make, will easily do this. A stopcock should also be placed on the connection within easy reach of the person operating the stove; this to be independent of the regular stops on the stove burners.

After setting the stove care and patience should be exercised in instructing the consumer how to use it. And at any time the Superintendent or his assistant should answer calls personally when complaints are made of any trouble connected with the use of stove.

I will say here that in all cases the air chambers of stove burners must be kept clean and open. I have known great complaint to be made of excellent stoves because the user was ignorant of the fact that the air in passing to burners had drawn in the dust and lint from carpet sweepings, thus obstructing the free passage of air to the gas, and causing it to smoke in burning. But once shown carefully, and the principle properly explained to them, the users of stoves seldom make a second complaint from same cause as before shown. So much for the stove.

The Superintendent must also have the power to sell the stove (after proper trial in all cases) for but slight advance, if any, over net cost. It is not worth while to try to make a profit on the sale of a stove. Once in use and satisfaction given, the gas stove becomes a most excellent promoter of the consumption of gas, and a consequent steadily increasing sale of gas with reasonable profit is the result to the company.

Where large use is made of stoves a proper system of discounts on the special rates already given is very beneficial, and the gas companies need have no fear of consequences in this case.

Let a consumer understand that you are really offering a cheap and excellent fuel, and he or she will use it freely. We need not confine our attention solely to cooking stoves. In the office of the gas company there should be

proper samples on exhibition of heaters for bedrooms, bath and office use. If care is exercised in the selection of these they can be as readily sold as cookers. Also tailoring iron heaters are very salable; and once in use in the shop they will never be discontinued.

The summer consumption of many consumers can thus be made to overrun the winter use of gas, in the majority of cases, where it is only used for lighting purposes.

Soldering furnaces and laundry rollers are easily sold; hatters' and dressmakers' irons are easily and well heated by placing on any sort of small gas furnace.

The time has passed for gas companies to sell their product for illuminating purposes only. Power, by the use of gas engines, can be easily and cheaply produced. Still, this latter source of consumption is not so easily introduced in many small towns, on account of the apparently high price charged by makers of this class of machinery. If they would endeavor to supply these proportionately as cheap as the stove makers offer their goods, the work of introducing them would be greatly facilitated. Still, once in use, the gas engine becomes a fixture. The foregoing, with exception of engine use, is written from personal experience. Four years ago it was considered by our company as hardly worth the trial to place gas stoves before our customers.

It was also believed that these articles would meet with readier sale if handled by the regular stove and tinware dealers of our town. An effort to induce these persons to carry and offer for sale a supply of gas stoves soon proved the fallacy of such reasoning. The gas company then took hold in earnest, and to-day have no cause to regret their action.

Our receipts have increased in a very healthy degree, and the demand for stoves is steadily growing. But we would suggest to our brother gas men—be careful and buy only the best and proper sized article. A gasoline stove of three burners, with portable oven, sells in stove stores for the same price that gas companies can offer their consumers a gas stove of twice the working capacity. You should also remember that an old gasoline stove can be readily refitted with gas burners; I have done this frequently, though I always endeavor first to sell a regular stove, because it is in the end the cheapest.

Our method has been to sell for net cost at start; and having fairly established the business, we can now sell at a little profit. Though this latter fact is due mainly on account of the stove makers having, during the last season, improved their wares considerably, and also lowered their prices.

Our friends—the electric light men—have kindly conceded to us the right to occupy this field, and in our own case at first did a little talking for us. They felt that having so long occupied the place as illuminators, we should not be entirely driven out of existence, because, as they declared, gas had *some* uses, and spoke of it, like the immortal *Toodles* denominated his wife's "coffin," "As a handy thing to have around the house."

Well, experience has proved the truth of this belief—for during the times when the great "light of the future" takes an occasional rest, the old-fashioned gas jet renders the darkness visible, and even disturbs the belief or faith some folks have in the wonderful radiance of the Edison 16-candle power incandescent lamp.

In closing this paper I would repeat—those of you who have not yet operated in this field should at once turn your attention to it; and you will not withdraw from it so long as a housekeeper can be found whose temper and pocket alike are sorely strained by using any other than a first-class gas stove.

Discussion.

Mr. E. McMillin—I will ask the gentleman if he has made any estimate as to what the probable increase of business has been from the use of gas stoves.

Mr. Bate—I have no exact figures to give in that respect. In our town, with about 380 consumers, we now have about 100 gas stoves in use. In all cases the gas accounts of those using the stoves have been increased from 100 to 200 per cent. With us the domestic use of gas reaches to almost one-third of our total consumption. At first the company was loath to consider the matter of introducing gas stoves. I found it was impossible to place them and charge the full rate of $2.50 for the gas consumed. Then I offered gas for domestic purposes at $2.25. I omitted to say that I expected a reasonable amount of gas would be used for fuel, and soon found that quite a number of people imposed on me by purchasing stoves, but their returns on meter showed little, if any, use of gas for fuel. After three or four months of this experience I made out their bills at the full price per thousand. Then disputes arose. In reply to their expostulations I said, "When I sold you that stove at cost I expected you to use it." Oftentimes the reply would be made, "I will use the stove or not, just as I see fit." This bickering went on for some time; but at the beginning of the next year I wrote out a little "dodger," which our collector distributed with monthly statement of gas consumed. The "dodger" stated that 1,000 feet monthly must be used to entitle the consumer to the discount—this in the meantime had been increased to 50 cents, or a net rate of $2 per thousand. I told the consumers that if they wanted cheap gas they must increase their use of it, so that we could afford to sell at low rates. The third year we allowed a still heavier discount to large consumers of gas for fuel. The plan has induced parties to use from 5,000 to 6,000 feet where 2,000 to 3,000 was formerly used. One man's account ran up to 8,500 feet. He said he was bound to get the highest discount that we allowed.

Gen. Hickenlooper inquired whether the consumer could not go on increasing his consumption to the point where he would get his gas for nothing. (Laughter.)

Mr. Bate said he drew the line at $1.50—the rate for a monthly cooking stove consumption of 5,000 feet. Those using gas for illuminating purposes only were charged $2.

Mr. Dittmar—I would like to ask Mr. Bate what sort of stove his company prefers to place in the houses of consumers.

Mr. Bate—That brings us face to face with our stove manufacturers. I speak honestly when I say my experience has led me to believe that the "Economy" is probably the most substantial stove, and the top burners are excellent; but I think the oven space is rather too small. Housekeepers have often said to me, "I like this stove, except that the oven is too small. I can bake only two pies at one time." I then had some extra trays made, in order to show that there was oven room enough for three pies. That pleased many; but in several cases complaint was made that the oven would not contain a pan large enough to bake extra bread loaves. I think the "Sun Dial" stove is about the same as the "Economy." A handsome new pattern of the "Sun Dial" has lately been brought out, and the listed price of same has been reduced. I have tried the "Retort" and "Sheldon" stoves, but do not find as ready a sale for them. The trouble with them is that the trivets on top of stove are apt to slip and upset. The Goodwin Company has latterly introduced still another new stove—one having an extra shelf in each top section, which adds materially to the size.

Mr. Dittmar—What stove gives the most general satisfaction?

Mr. Bate—I would not like to make a positive statement in regard to that. The "Economy" and "Sun Dial" run about alike. A good feature in the latter is the packing around the oven, by which the heat is materially retained.

Mr. Dittmar—You have never tested between those stoves to see which would consume the most gas?

Mr. Bate—I think the Goodwin stove is a trifle the more economical; but, as I said, the "Economy" and the "Sun Dial" are closely together.

Mr. Enfield—How did Mr. Bate introduce his stoves—by personal solicitation, by advertising, or both?

Mr. Bate—I do not believe much in the principle of advertising as applied to gas stoves—that is, in the daily or weekly papers—because in country towns the majority of papers circulate among farmers. In the daily papers I occasionally insert a squib calling attention to the gas stove; but I doubt whether it does much good. I have printed on the backs of the bills a notice that we have at our office a full assortment of gas stoves always on hand. The best advertising medium is afforded by the users themselves; when consumers have stoves set up in their houses they call in all the neighbors to make an inspection. I would talk to the ladies about the merits of the gas stove rather than to the men, because the lady folks are apt to understand the situation better.

Mr. Converse—I have had considerable experience in the matter of introducing gas stoves, and my acquaintance with the subject corresponds to that of Mr. Bate. In 1879 we commenced their introduction, and that year placed 135 of them. I loaded an express wagon with gas stoves; went to the houses of our customers, and requested the privilege of putting up a gas cooker. I said the stoves were not for sale; we only wanted a trial of them made; and our success was such that I do not think we had to take back half-a-dozen of the 135 so placed. Now, the gas stove business is uppermost in my mind. At present we have, in our small town, 245 stoves in use. Our customers are all well satisfied with them. We find that all the cooking, ironing and washing requisite in a family of 5 or 6 persons can be accomplished with a monthly consumption of about 2,500 cubic feet. We have set the "Economy," the "Retort," and one or two "Sheldon" stoves. I think they are all giving very good satisfaction. The "Economy" and "Retort" stoves do excellent work.

Mr. Reinmund—Do you scale your gas prices?

Mr. Converse—Our rate is uniform, at $2 per 1,000. This has been a dull year, yet I found we had secured a very material increase of consumption (comparing months of June, July and August) over the preceding year. On the other hand (making comparison between the winter months of same years), the consumption showed a slight falling off. I firmly believe gas cooking stoves will in the future still more greatly increase our summer consumption.

Mr. Enfield said his experience went to show that it paid a gas company to advertise. He (Mr. Enfield) had always endeavored to connect his stoves

direct from meter by carrying the pipe along the joists of cellar top over to the kitchen. In all cases, where possible, he himself ran a straight half-inch pipe from meter. For all this fitting his company charged net cost.

Mr. Bate—I would like to ask Mr. Converse what size of stove he finds most acceptable to consumers?

Mr. Converse—We generally sell "Economy"—Nos. 6 and 7 Economy, and the No. 8 "Sheldon."

Mr. Bate—That is, as a rule, 3-burner stoves. When we began the sale of stoves I tried the "Economy," having two burners on top, with oven and roasting chamber. I thought they would meet with ready sale, since they had a greater capacity than the 3-burner gasoline stoves; but when people came to look at them they would not purchase because they were too small. We did sell a number of the 3-burner size, but afterwards we secured a quantity of American Meter Company's "No. 8" 4-hole stoves. In several cases people who had the small stoves exchanged them for the others. Now we purchase only the 4-hole stove. Their cost averages about $25, and I find they sell more readily than any other.

Mr. Coverdale stated that all requisite cooking for his family (six persons) was done on a "No. 5," or "No. 6, Economy." One difficulty in the way of introducing stoves appeared to be that people did not know what they could accomplish with a small gas cooker.

Mr. Bate—A familiar complaint made by our consumers was that a large batch of bread could not be made on account of size of oven. Our company have adopted the plan, as to all new houses, of laying on especial pipe for gas stove supply, whether or not the householders desired to use the gas stoves. We put in a lead connection because people may want to scrub the floor space under the stove, and thus move it a trifle. Let them once know they can move it and probably they will never touch it; but when a stove is stiffly coupled they are always worrying because they cannot move it. Formerly most stoves had legs, but now some descriptions are made so as to stand squarely on the floor.

Mr. Thompson—I would like to say a word or two, as an individual, on the gas stove question. My family have been using a "No. 7 Economy" for a year. A point I desire to make about them is in regard to the comparative cheapness of their operation. Our bill for 1884, less ten days during the February floods, was $22.50. That expense covered the entire culinary work of our family, which is small. My coal bills for same average length of time, when employing an ordinary coal-heated cooker, to do the same amount of work, varied between $30 and $35 per year. Now, that comparison is largely in favor of gas as against coal. The other comparisons, as to cleanliness, etc., you, of course, know. Sometimes I am told, speaking of suburban places, gas stoves cannot be sold, because consumers do not get gas at as cheap rates as those of Cincinnati. Now, as a general rule, where gas is cheap coal is also cheap, but dear coal also means high priced gas, making matters equal as to localities.

Mr. Bate agreed with Mr. Thompson, and said the average monthly consumption of a household for cooking purposes would be about 2,000 cubic feet. He found the people of his town said they could not have bought enough wood to do the requisite work for the price they paid for gas.

Mr. McLean stated that his company had a number of consumers who used gas for cooking purposes only.

Mr. Allison said that three years ago his company hired a long and narrow office room on the first floor of a building and used it as a storeroom. This room was then partitioned off into three apartments; a good cook—a woman—was employed and put in charge of the establishment. Her first move was to invite her lady friends to a lunch which was cooked on the gas stoves. Day after day she would thus entertain several parties. The women all went off pleased, talked to their husbands about the affair, and so got them interested. Every time our cook (she was saleslady too) induced a masculine visitor to partake of a lunch, prepared before him on one of the stoves, a sale was almost sure to be effected. We still keep the practice up.

Mr. Enfield said his experience with reference to connecting gas stoves had been the same as that of Mr. Bate. He found, to ensure a good supply of gas, direct connection must be made with the meter. He had sometimes connected a stove to a bracket. Remembered, for instance, where he had placed stoves in adjoining houses that were occupied by sisters. The houses were exact duplicates as to construction, etc. At first a stove was placed in one building merely as an experiment. A direct service pipe was run from the meter, and the apparatus gave very great satisfaction. The occupants of other house then desired to try one. It was put in without a direct supply pipe, and the folks could not get enough gas to maintain one burner, much less two. A distinct supply pipe remedied every difficulty. He remembered other instances in which like complaints ensued, and which were similarly quieted.

Mr. Bate—The reason why, in every instance, the service should be run to the meter is that, no matter how good a workman the gasfitter may be, he will probably have allowed some accumulation of red lead obstruction in the coupling or fitting. I have had to take down new gas fixtures within a few days after they were put up. I told the fitters the trouble was simply that the gas could not find its way through the results of their negligence, and have received the reply, "Oh, no; it could not have been that; it was bad gas or a poor meter that was at the bottom of it." In some cases the sockets were cemented over with red lead.

Mr. Salter inquired what pressure Mr. Bate's works carried.

Mr. Bate—I never carry less than a 2-inch pressure. Selling gas stoves, I am bound to have pressure whenever people may need it. If I were to drop down to an inch pressure it might be done just at the time some housekeeper was engaged in her cooking, and dissatisfaction would arise. I believe in carrying just as high a pressure for gas stove use as for illuminating supply.

Mr. Coverdale—I would like to give my experience with gas stoves. I was interested in a gas plant in the South, and it was my opinion that the people there would not use gas stoves at all. My son-in-law was in charge of the works, and tried to convince me the South was just the place to introduce the gas cooker. At first I would not listen to it. Finally I said, "Go ahead, and try." He ordered specimens of different makes of stoves—the "Economy," the "McDonald," and the "Sheldon." On a certain date an advertisement was inserted in the newspapers to the effect that there would be a lunch at the gas office at a certain hour on such a day, and a general invitation was extended. I came on to witness the proceedings. A couple dozen spring chickens, and a goodly stock of other eatables, were purchased. On the day set for the "feast" my daughter was pressed into service; she set to work with a will—made and cooked jelly-cake, pies, etc., on the gas stoves. During that day, at one time, we had six 4-holed stoves at work, and at same time had fourteen lady visitors in the store, and not a single person objected to the heat. With the close of day we had disposed of fourteen ranges. Since then we have twice ordered stoves, until now we have out about 40. We have never taken a single stove out, unless perhaps it was to make the exchange of replacing a small one with a larger size. Our price for gas is $2, both for cooking and lighting purposes. One month we carried a pressure of 24 tenths. I found our leakage account swelled too rapidly. They tried to convince me that it was necessary to have 24 tenths pressure; I said, then we had better not encourage the use of gas stoves. I advised keeping the pressure down, and noting what difference was so made. We decreased the pressure to about 12 tenths, and never received a complaint from users of stoves. We have consumers employing gas cookers who do not burn any gas for illumination. All that is required to encourage the employment of gas cookers is a reasonable effort on the part of the fraternity. Success is certain. I believe advertising, while good and beneficial, will not be as successful in this matter (speaking as to small towns) as personal effort made by solicitation. In very large towns you could not, of course, follow out the latter practice very well. Of course we all know that day consumption is a great thing for small gas works. I think the gas stove business is sure to be one of the best means for increasing the gas consumption of our lesser towns. We keep all sorts of gas stoves on hand, and have never had occasion to remove one from the house in which it was put up. Among our consumers a good argument for the gas stove is this: In the South a coal cooking stove, on account of the heat it throws off, is located in that part of the kitchen as remote from the dining and sitting rooms as is possible; consequently the mistress of the household does not see it very often, and she allows the cook to "run the kitchen." Now, I can say to the mistress, "If you put in a gas stove you can save (owing to personal supervision over the 'help,' made possible and easy by the absence of fatiguing heat) the cost of the gas that will be consumed by it;" closing the argument by saying that I can put up the gas stove, should she see fit, just as well in her sitting room as in the kitchen, and that its presence need never be offensive. We should do everything we can to encourage this stove business; and I believe we should talk freely here among ourselves as to the merits of the various stoves now in the market, to the end that we may determine which sort is the best for our companies to purchase, to say nothing about the fact that the description best liked by ourselves will be best appreciated by and most beneficial to our consumers.

Mr. Robinson—In view of what has been said about gas stoves, I would like to say a word or two about our experience while introducing them at Columbus, Ohio. I think our President (Mr. P. W. Huntington) is a pioneer in the matter of introducing a gas stove into his kitchen. For a long time it seemed as though our efforts would be fruitless. I advised all my personal friends as to the advantages of gas cookers, and let them know that the company carried a most varied assortment of sizes and styles. I further advised purchasers to procure a large sized stove. Why? Because if the cook only wanted to make tea, she need light but one burner; if she desired to cook dinner for a number of persons, the large apparatus afforded opportunity to do the work satisfactorily. After a while we were quite successful in the matter of inducing our consumers to buy gas cookers. With reference to point of supply and size of pipe, I told our gasfitters they should always run a ¾-inch pipe direct from meter to stove. This instruction was given

because we do not run under a high pressure in daytime, and we did not want to be required to overcome any friction as to delivering gas to stove burners. I claim that if you have a good diameter to supply pipes you are certain to get a sufficient pressure. I think if Mr. Bate will put in ¾-inch instead of ½-inch pipe he can work under 1½ inch pressure instead of 2 inch, and so lessen his leakage—if he has any; and most gas companies do. I make large connections; it costs but little more. I am an advocate of large stoves and ample connections.

Mr. Bate—I spoke about a two-inch pressure. In our town we are differently situated from many others. We have a larger mileage of mains than obtains in most places of similar size, owing to numerous extensions supplying street lamps only. We have 14 miles of mains; and our town has but a population of 10,000 inhabitants. In isolated instances an occasional gas stove will come into use at a point where 1½-inch pressure would perhaps not give a good result. When I set up a gas stove I want no failure to be made with it.

Mr. McMillin—I would suggest that this question of pressure might be overcome by putting on an automatic governor—one which will put the pressure on when it is needed and take it off when not needed.

Mr. Connelly—There is a difference of opinion as to the pressure absolutely necessary in order to get satisfaction from gas stoves. Some say twenty-tenths is required at their works, and again the statement is made that, at other places, ten or twelve-tenths is sufficient. From the fact that in many localities perfect satisfaction accrues from the lesser pressure, I incline to the idea that most works now carrying 20 to 24-tenths could obtain satisfactory results from ten-tenths, urging the fact, in support of that idea, that the mains are not taxed during the day, and taking for granted the supply pipes from meter to stove are sufficiently ample. I would like to hear from some of the gentlemen who have made experiments in that connection.

Mr. Fullager stated he had obtained perfect satisfaction from an initial pressure from the works of twelve-tenths.

Mr. Coverdale's experience coincided with that of Mr. Fullager.

Mr. Converse said thirteen-tenths was ample in his case.

Mr. Enfield said his experience had been that an average of fifteen-tenths was quite sufficient. He thought most stoves were designed to work under ten-tenths; but if such a low initial pressure were carried by a works, he feared that too considerable friction would have to be overcome. It must be remembered that the conduits in many towns had insufficient diameters for the carrying duty exacted from them. Did they carry only ten-tenths they were running the risk of giving an insufficient supply. He had known consumers to complain they could not cook quickly enough with their gas stoves—that it would take too long to broil a steak, etc. He had found by carrying fifteen-tenths he could get sufficient pressure, no matter where the stove was located.

Mr. McMillin thought that it would not be possible to establish a rule that would apply to all places. The day consumption in Columbus was occasionally as great as the night consumption. If ten-tenths were satisfactory at Columbus, it did not follow that a like pressure would do in other places. In Columbus they carried from fourteen to fifteen-tenths, sometimes getting along with thirteen.

Mr. Huntington, speaking now as a gas consumer, said for about five years every pound of food cooked in his house had been cooked on gas stoves. From his experience he knew that the gas stove saved dirt, time, and *dollars*.

Gen. Hickenlooper—It may be proper for me to say something about our experience in Cincinnati, Ohio, where we have put out between 2,200 and 2,300 stoves. We adopted the policy of advertising their merits on the backs of our bills. The character of the advertisement was the certificate of indorsement of the parties who were using, or had been using, the stoves. We obtained from the users a certificate setting forth the advantages of the stove, together with their opinions as to the merits and economy of gas cookers. Without a single exception I believe these were favorable. We compiled the opinions in proper shape, and would publish a series of them, perhaps half-a-dozen each month, keeping on as long as the list lasted. We advertised in the public prints to some extent, often embellishing the "ads" with "cuts" of the stove. On one occasion we simply said: "Refer to the following parties," giving a column of names of parties who were using the cookers. In the matter of selling stoves we deem it better policy to encourage the opening of a separate and independent store in the city where can be found anything in that line. Our agent also adopted a system similar to that practiced by sewing machine agents; that is, purchased a horse, harnessed it into a nice carriage, and employed a clever woman, who was instructed to call at the residences of the ladies who had purchased stoves, and inquire whether the cookers were performing satisfactorily; if they were not working properly, she would name a time to suit their convenience when she should call and make investigation of the trouble. At the appointed hour she would be present and do that which she was certainly capable of doing—demonstrate that the stove would do all that had been represented it would do. The pressure given by the Cincinnati company is about 2 inches. I do not know that we have had many complaints as to lack of gas supply; but wherever complaint did arise it could, no doubt, be traced to the fittings. In such cases an independent line, run from the meter, ought to remedy the trouble. I know of but two cases in Cincinnati where consumers use gas in cooking apparatus, and do not use gas for illumination.

Membership List Ohio Gas Association.

Honorary Member.

Prof. S. H. Douglas, Ann Arbor, Mich.

Charter Members.

*J. Anderson, Columbus.	*M. C. Allison, Xenia.
*W. T. Bowers, Hillsboro.	*Jos. Bate, Tiffin.
*A. S. Bushnell, Springfield.	*R. T. Coverdale, Cincinnati.
*C. M. Converse, Delaware.	*J. S. Connelly, Pittsburgh, Pa.
*E. S. Funnell, Albany, N. Y.	F. Fabing, Fremont.
*John Fullager, Cincinnati.	T. W. Foley, London.
*R. P. Green, Columbus.	*E. Gwynne, Springfield.
*A. Hickenlooper, Cincinnati.	*G. S. Harris, Mansfield.
*P. W. Huntington, Columbus.	*E. W. Hamlin, Wilmington.
J. A. Harris, Philadelphia, Pa.	Jos. Light, Dayton.
R. Lee, Piqua.	*J. McCann, Portsmouth.
M. McMillin, Marietta.	*J. M. McLean, Washington, C. H.
W. A. McDonald, Albany, N. Y.	E. D. Moore, Circleville.
*E. McMillin, Columbus.	*E. Printz, Zanesville.
*W. W. Prichard, Ironton.	*A. B. Robinson, Columbus.
J. A. Raynolds, Canton.	*H. J. Reinmund, Lancaster.
*H. Ranshaw, Cincinnati.	*J. B. Smallwood, Baltimore, Md.
F. A. Stacey, Chillicothe.	*G. H. Tayler, Warren.
D. C. Spinney, Dayton.	J. H. Walker, jr., St. Louis, Mo.
*H. C. Thompson, Cincinnati.	*H. Wilkiemeyer, Lancaster.
*C. H. Welch, Athens.	T. Wood, Sandusky.

Members admitted at First Annual Meeting.

*F. Bate, Galion.	*W. Blinks, M. City, Ind.
*I. Butterworth, Columbus.	T. Burch, Cincinnati.
M. Coombs, Youngstown.	*A. D. Cressler, Ft. Wayne, Ind.
*T. E. Connelly, Pittsburg, Pa.	*R. H. Canby, Bellefontaine.
*J. Dell, St. Louis, Mo.	R. R. Dickey, Dayton.
*W. Enfield, Columbus.	*R. A. Dittmar, Troy.
*J. J. Griffin, Philadelphia, Pa.	*H. Felt, Cincinnati.
*J. Gwynne, Fostoria.	*M. A. Germunder, Columbus.
*N. Kinsman, Springfield.	*J. L. Kelly, Middletown.
T. Kates, Cincinnati.	N. G. Keenan, Cincinnati.
J. H. Phillips, Cincinnati.	W. A. Ross, Kenton.
*D. T. Roots, Connersville, Ind.	*W. S. Stacey, Cincinnati.
*A. B. Stannard, Philadelphia, Pa.	*J. Salter, Covington, Ky.
*R. Salter, Covington, Ky.	*J. S. Thomas, Wilmington.
*G. Turner, jr., Cincinnati.	C. Taylor, Cincinnati.

* Those whose names are marked with an asterisk were present at Cincinnati meeting.

[To be Continued.]

The Dangers of Water Gas.

[A recent issue of the *Boston Medical and Surgical Journal* contains the following editorial comments on the conclusions so far arrived at by Profs. Sedgwick and Nichols in regard to their experiments on the death-doing capacity of water gas. It seems almost superfluous to call attention to the high standing enjoyed by the *Medical and Surgical Journal* among the scientific men of the Eastern States.]

"Considered as a sanitary matter, the manufacture and use of water gas for domestic purposes cannot be defended for a moment. On the contrary, every consideration of safety is opposed to the introduction of this dangerous agent into dwelling houses and public buildings. The source of the danger lies in the relatively great amount of carbonic oxide which is left in the product of the process of converting steam into gas by its exposure to incandescent anthracite. As is well known, carbonic oxide is of all gaseous poisons the most lethal; it kills as surely, if not as quickly, as hydrocyanic acid; and to admit it to inhabited rooms as an illuminating agent, under even more than ordinary safeguards against leakage, is an experiment the risk of which cannot be denied.

"These are trite sayings. Yet the energetic agents of speculative enterprises, eager to place their 'plant' and to make money out of the dear public, will declare that there is no danger in water gas worth mentioning. They catch the attention by emphasizing the economic side of the case, and by reiterating how cheaply they can supply the new article. They wish all statutory restrictions removed, so that, in the name of economy, they may make and send through our streets and into our houses an illuminating gas containing 30 per cent., more or less, of carbonic oxide. They grow hilari-

ous when their attention is called to the record of deaths by the accidental inhalation of the 'improved' gas in cities which have surrendered to their persuasive overtures. They declare that the coal gas ordinarily used for illuminating purposes contains carbonic oxide like their water gas, but that no one thinks of going back to whale oil or tallow candles through any apprehensions on that account. In short, they sneer at all the cautions which unprejudiced and unpurchased sanitary chemists have uttered since the composition of water gas was first appreciated, and they, in effect, ask the people to take a catamount or lioness into their laps to caress in place of the familiar domesticated animal which gives its name to the whole feline family. Sensible persons will hesitate before they try the experiment, and will choose rather to endure the gas they have than to fly to other gas four or five times more dangerous to life.

"These reflections are suggested by a report of recent investigations made under the instructions and direction of the Massachusetts Board of Health, Lunacy, and Charity, by Professors Sedgwick and Nichols, of the Institute of Technology, in accordance with an order of the Massachusetts Legislature. The report, though only preliminary to a fuller exposition of the subject after further experiments have been made by the authors, is very convincing. After a general statement of the nature and composition of illuminating gas, of which 'the only ingredient possessed of really toxic properties is carbonic oxide,' this being 'intensely poisonous,' the report presents a summary of the conclusions to which the authors have been led by their experiments. Of these we give a condensed abstract:

"1. Water gas is decidedly more poisonous than coal gas.

"2. An atmosphere containing a small percentage of coal gas may be breathed many hours without serious effect, while an atmosphere containing the same amount of water gas will be injurious and even fatal.

"3. On account of natural ventilation constantly going on in the rooms, thus permitting considerable diffusion, ordinary coal gas, containing about 7 per cent. of carbonic oxide, is not a source of serious danger; with water gas, on the other hand, on account of the large proportion (30 per cent.) of carbonic oxide, the danger line is easy to reach. And it must not be inferred that a gas containing twice as much carbonic oxide as another is necessarily only twice as dangerous. Water gas is not only in itself more poisonous than coal gas, but is also far more likely to produce injurious effects from similar accidental causes.

"4. Dogs, cats, rabbits, and pigeons did not show any symptoms of poisoning after exposure for many hours to an atmosphere containing one per cent. of coal gas, being apparently able to resist it almost indefinitely; but the same animals and birds when exposed, under the same conditions, to an atmosphere containing from one-half to one per cent. of the water gas invariably showed marked symptoms of poisoning at the end of an hour and a half, and death generally resulted after from five to eight hours of exposure to an atmosphere containing not more than one per cent.

"5. If, instead of comparing the effects of the same percentage of the two gases, we consider the *time* necessary to cause poisoning by the use of the same quantities of gas under the same conditions, we find a contrast not less striking. With water gas let into a chamber of known capacity (700 cubic feet) at the rate of six feet per hour, the animals under observation showed well-developed symptoms of poisoning in an hour and a half, and were all dead within eight hours. In a corresponding experiment with coal gas, a similar set of animals presented symptoms from which recovery would have been possible, and even easy, had they been set free; after twenty-four hours of continuous exposure, one cat and one rabbit were dead, but the other animals (dogs, cats, and rabbits) were not even unconscious.

"It cannot excite surprise that, after these results, the report should contain these words in its closing paragraph: 'Our opinion, based upon experiments, is decidedly averse to the general distribution of the so-called water gas.' Earnestly solicitous to promote all measures for public health and to oppose the advance, insidious or open, of all projects having a contrary tendency, we commend these independent and trustworthy observations of Professors Sedgwick and Nichols to the attention of our Legislatures, and hope none of them will be tempted by false doctrines or other considerations to rescind the wise provision which forbids the manufacture of gas containing more than ten per cent. of carbonic oxide."

[A Paper read before the Society of Gas Lighting.]

Petroleum and its Residuals.

By Wm. Farmer, C.E.

During the year 1868 the writer was requested by Mr. Jos. Sabbaton, the Engineer of the Manhattan Gas Light Company, of New York city, to make a series of experiments on the coal and oil process, which was introduced by Mr. McKenzie, of Scotland. In this process a small proportion of the coal has to be pulverized for the purpose of absorbing the oil, and a certain proportion of the mixture is then mixed with the ordinary caking coal.

RESIDUUM AND CAKING COAL.

The caking coal which we used in the two following experiments was first tested, and the illuminating power of the gas therefrom was found to be 12 candles. The specific gravity of the residuum was 0.930; and accordingly one gallon of the residuum weighed 7.75 pounds. The gases were tested on the old Birmingham 15-hole Argand burner.

First Test.—With a mixture composed of 200 pounds of the coal and 10 pounds of the residuum, we obtained, with a dull cherry-red heat, in 3 hours and 30 minutes, 933 cubic feet of gas; or, in other words, one pound of the mixture produced 4.44 cubic feet of gas. The illuminating power of the gas therefrom, when consumed at the rate of 5 cubic feet per hour, was 17 candles. The illuminating power of the gas from the residuum may be now easily determined by the old rule of alligation, as follows:

	Pounds.		Candles.		Candle Feet.
Caking coal.....	200	×	12	=	2,400
Residuum.....	10	×	x	=	$10x$
	210				$10x + 2{,}400$

$$\text{And } \frac{10x + 2{,}400}{210} = 17 \text{ candles.}$$

$$10x + 2400 = 3570.$$

$$10x = 3570 - 2400 = 1170.$$

$$x = \frac{1170}{10} = 117 \text{ candles.}$$

Accordingly, with a yield of 4.44 cubic feet per pound, the illuminating power of the gas from the residuum was 117 candles; and one pound of the residuum produced $4.44 \times 117 = 519.48$ candle feet. And one gallon (231 cubic inches) of the residuum produced 34.41 cubic feet of 117 candle gas.

Equivalents.

At	5	cubic feet	per pound	of residuum.....	101.89 candles.
"	6	"	"	"	86.58 "
"	7	"	"	"	74.21 "
"	8	"	"	"	64.93 "
"	9	"	"	"	57.72 "
"	10	"	"	"	51.94 "

These results would have been 12 per cent. higher if we had tested the gases on the burners used at the present time (1885); and still higher if we had used an exhauster.

Second Test.—With a mixture composed of 190 pounds of the coal and 10 pounds of the residuum, we obtained, with a cherry-red heat, 906 cubic feet of gas, or 4.53 cubic feet per pound of the mixture. The illuminating power of the gas therefrom, when consumed at the rate of 5 cubic feet per hour, was 16.70 candles. And the illuminating power of the gas from the residuum, when calculated as before, was 106 candles. Consequently we obtained 480.18 candle feet from one pound of the residuum.

Equivalents.

At	5	cubic feet	per pound	of residuum.....	96.03 candles.
"	6	"	"	"	80.03 "
"	7	"	"	"	68.59 "
"	8	"	"	"	60.02 "
"	9	"	"	"	53.35 "
"	10	"	"	"	48.06 "

As the illuminating power of the gas from the residuum was so very much higher than that recorded in the books of the Manhattan Gas Light Company, or in any other books, Mr. Sabbaton and I were very much surprised. As Mr. Sabbaton could hardly believe it, he laid the report before Prof. Torrey and Dr. Carl Schultz, for the purpose of getting their opinion on the methods by which these results were obtained, and they decided that the methods were correct.

CRUDE PETROLEUM.

During the year 1870 Mr. C. V. Smith, the late Engineer of the Manhattan Gas Light Company, and the writer made the following experiments with crude petroleum having a specific gravity of 0.800, and accordingly one gallon (231 cubic inches) of the oil weighed 6.37 pounds. The gas was tested on the Sugg standard Argand burner. In the three next experiments the crude oil was delivered through a wrought iron pipe into the rear end of the retort. In the following calculations the candle power of air is represented by the negative quantity —50; that of hydrogen and carbonic oxide by the negative —4.

First Test.—Three gallons, or 20 pounds, of the crude oil produced 283 cubic feet of gas (or 14.15 cubic feet per pound) in one hour with a cherry-red heat. With 50 per cent. of hydrogen gas, the illuminating power of the mixture was 25 candles; and the illuminating power of the gas from the crude petroleum was as follows:

	Cubic Feet.		Candles.		Candle Feet.
Oil gas	50	×	x	=	$50x$
Hydrogen	50	×	—4	=	—200
	100				$50x - 200$

$$\text{And } \frac{50x - 200}{100} = 25 \text{ candles.}$$

$$50x - 200 = 2500.$$

$$50x - 2500 + 200 = 2700.$$

$$x = \frac{2700}{50} = 54 \text{ candles.}$$

Accordingly, with a yield of 14.15 cubic feet per pound of the oil, the illuminating power of the gas therefrom was 54 candles. And one pound of the crude oil produced 764.10 candle feet.

Equivalents.

At	5	cubic feet	per pound	of oil	152.82 candles.
"	6	"	"	"	127.35 "
"	7	"	"	"	109.15 "
"	8	"	"	"	95.51 "
"	9	"	"	"	84.90 "
"	10	"	"	"	76.41 "
"	11	"	"	"	69.46 "
"	12	"	"	"	63.67 "

Second Test.—Three gallons, or 20 pounds, of the crude petroleum produced 186 cubic feet of gas, with a dull cherry-red heat, in one hour, which was equivalent to 9.30 cubic feet per pound. When 50 per cent. of air was mixed with the oil gas the illuminating power of the mixture was 21.95 candles. And the illuminating power of the gas from the oil was as follows:

	Cubic Feet.		Candles.		Candle Feet.
Oil gas	50	×	x	=	$50x$
Air	50	×	—50	=	—2500
	100				$50x - 2500$

$$\text{And } \frac{50x - 2500}{100} = 21.95 \text{ candles.}$$

$$50x - 2500 = 2195.$$

$$50x = 2195 + 2500 = 4695.$$

$$x = \frac{4695}{50} = 93.90 \text{ candles.}$$

Accordingly, with a yield of 9.30 cubic feet per pound of oil, the illuminating power of the gas was 93.90 candles; and one pound of the petroleum produced 873.27 candle feet.

Equivalents.

At	5	cubic feet	per pound	of oil	174.65 candles.
"	6	"	"	"	145.54 "
"	7	"	"	"	124.75 "
"	8	"	"	"	109.15 "
"	9	"	"	"	97.03 "
"	10	"	"	"	87.32 "

When 80 per cent. of hydrogen gas was mixed with the oil gas the illuminating power of the mixture was 15.64 candles; and the illuminating power of the gas from the petroleum, when calculated as per rule used for hydrogen before, was 94.20 candles. Accordingly, with a yield of 9.30 cubic feet per pound of oil, the illuminating power of the gas from the oil was 94.20 candles. And one pound of the oil produced 876.06 candle feet.

Equivalents.

At	5	cubic feet	per pound	of oil	175.21 candles.
"	6	"	"	"	146.01 "
"	7	"	"	"	125.15 "
"	8	"	"	"	109.50 "
"	9	"	"	"	97.34 "
"	10	"	"	"	87.60 "

Third Test.—Three gallons, or 20 pounds, of the oil produced 270 cubic feet of gas in 50 minutes, with a bright orange heat, or 13.50 cubic feet per pound. When 50 per cent. of hydrogen was mixed with the oil gas the illuminating power of the mixture was 16.89 candles; and the illuminating power of the gas obtained from the oil, when calculated by the rule as before given for hydrogen, was 37.78 candles. Accordingly, with a yield of 13.50 cubic feet per pound of oil, the illuminating power of the gas therefrom was 37.78 candles; and one pound of the oil produced only 510 candle feet. The heat in this case was too great for the supply of oil; and consequently there would be a great deposit of lampblack.

For the following test we increased the length of the pipe in retort, so that the oil would be exposed to about twice the length of that used in the previous tests before it reached the rear end of the retort.

Fourth Test.—Three gallons, or 20 pounds, of the crude oil produced 197 cubic feet of gas in one hour, with a dull cherry-red heat, or 9.85 cubic feet per pound. When 50 per cent. of hydrogen gas was mixed with the oil gas the illuminating power of the mixture was 25 candles; and the illuminating power of the gas obtained from the oil, when calculated by the rule before used for hydrogen, was 100 candles. Accordingly, with a yield of 9.85 cubic feet of gas from one pound of the oil, the illuminating power of the gas therefrom was 100 candles; and one pound of the oil produced 985 candle feet.

Equivalents.

At	5	cubic feet	per pound	of the oil	197.00 candles.
"	6	"	"	"	164.16 "
"	7	"	"	"	140.71 "
"	8	"	"	"	123.12 "
"	9	"	"	"	109.44 "
"	10	"	"	"	98.50 "

These results are 12.43 per cent. higher than those of the second test with shorter pipe.

NAPHTHA.

As I have never made any experiments with naphtha, I will take the reports of the water gas engineers of this city. They claim that 5¼ gallons, or 30.18 pounds, of naphtha in every 1,000 cubic feet of the commercial gas is generally sufficient to raise the illuminating power of the water gas to about 28 candles. Consequently, at a yield of 10 cubic feet per gallon of 5.75 pounds, the yield from 5¼ gallons will be 301.18 cubic feet. On this basis the illuminating power of the gas from naphtha, when calculated as per rule before given for hydrogen mixtures, is 102.24 candles. And accordingly one pound of naphtha will yield 10 cubic feet of 102.24 candle gas, or 1,022.40 candle feet.

Equivalents.

At	5	cubic feet	per pound	of naphtha	204.48 cubic feet.
"	6	"	"	"	170.40 "
"	7	"	"	"	146.04 "
"	8	"	"	"	127.80 "
"	9	"	"	"	113.60 "
"	10	"	"	"	102.24 "
"	11	"	"	"	92.94 "
"	12	"	"	"	85.20 "
"	13	"	"	"	78.64 "
"	14	"	"	"	73.02 "
"	15	"	"	"	68.16 "

These results are just 3.79 per cent. higher than those which we obtained in the fourth test from crude petroleum. This difference may be accounted for in two ways—viz., the naphtha may give a greater yield than that obtained from crude petroleum, or the process which they use may produce a greater yield than that which we used in the experiments.

CONCLUSIONS.

1. That 1,000 candle feet may be readily obtained from one pound of good naphtha.
2. That naphtha, at the present time, is the cheapest enricher that can be obtained in the market.
3. That naphtha may be converted into a fixed gas without depositing any of its carbon.
4. That naphtha should be distilled in very long retorts, or a series of them, where the heat is gradually increased from a very low heat to a very high one.
5. That the inferior gas, whether it be made from coal, wood, or water and carbon, should be run through the naphtha benches with the oil gas.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SHERBORNE, March 10, 1885.

The removal of Mr. G. Ernest Stevenson to the distant locality of Buenos Ayres is an event possessing more than a mere local interest. He has been Engineer, and latterly Engineer and Secretary, to the Peterborough Gas Company for some years, and the severance of those ties has been observed, in the usual manner, by the holding of a farewell dinner and the presentation of a handsome testimonial. In his departure to the well-known capital of the Argentine Republic, however, Mr. Stevenson leaves a vacancy that will extend much further than the surroundings of the Peterborough Gas Company, for he was a familiar figure at the meetings of the "Gas Institute," being a frequent contributor of papers, and a spirited participator in the discussions. His papers and speeches in connection with the subject of regenerative firing have particularly attracted attention. He was also President (for last year) of the Midland Association of Gas Managers. So his tempo-

rary exile will be regretted by a large number of friends and acquaintances, who will not fail to miss his familiar presence at our meetings of gas engineers; and will hope for the time when he will again return to take his place amongst us—I was going to say, a millionaire, but recollected in time how little chance we poor gas engineers have of attaining so enviable a position. The literal meaning of the name of the town selected for his new sphere of labor, I am told, is "pure air;" and it may be safely prophesied that during the time of his sojourn there the inhabitants will also enjoy the possibly less important, but by no means insignificant, advantage of "pure gas."

The Metropolitan Board of Works, always peculiarly "fussy" over the various matters that come before them, and energetic in the interests they represent, having possibly become weary of costly electric lighting experiments, have now hit upon the pleasing recreation afforded by a portable photometer, with which to perambulate the streets and test the gas as supplied to the public at any consumer's house that may be selected. Since a regular system, controlled by the Gas Referees, a body appointed expressly for the purpose, exists with the object of daily examining the gas supplied from the various gas works in the metropolis; and as these gentlemen have under their supervision about a score of testing rooms, the various situations of which have been selected by themselves with a view of securing a fair average result, and from which returns are daily received, the necessity of the itinerant photometer is not very obvious. The gas companies of London may well think that no further extension of the gas testing system is needed; seeing that the sum that they have been called upon to pay during the past year for the expenses of the "official officers," as Mr. Thompson Nash calls them—the gas referees who test the illuminating power, and the official auditor who examines the accounts—approach towards the substantial sum of £4,000. The advantage afforded by the peripatetic system of gas testing, as compared with the testing station situated as nearly as possible in the center of the various districts, is not very obvious to the professional gas engineer; though possibly it is very simple to that superior form of genius, conspicuous for glaring errors in respect to elementary details, which, emanating from the columns of the daily press and from the meetings of local authorities, so frequently aspires to direct the professional engineer as to the management of his own business.

At a recent meeting of the Metropolitan Board of Works the Special Referees and Sanitary Committee presented a report, setting forth that out of 55 examinations made with the portable photometer, in 24 cases the gas was found to be below the standard prescribed. And this portable apparatus is constructed and used, as far as possible, in accordance with the apparatus and method prescribed by the Gas Referees. Yet, at the period during which the above results were obtained, the Gas Referees were daily reporting that the gas was up to and usually well above the standard. It is also remarkable to notice that the 24 deficiencies are distributed, with tolerable impartiality, amongst the three gas companies supplying the metropolis. Two theories are available for accounting for this remarkable discrepancy. The first is, that continual trundling about the streets disturbs that sensitive condition of the photometrical appliances so necessary to the securing of accurate results; and the second, that peculiarly unfavorable localities were selected for some of the tests; such as taking the gas after it had passed through tortuous and long lengths of small pipes exposed to cold and damp, which might cause condensation and depreciation in quality. At present no advantage can follow from these results, because the portable photometer is not a legal instrument. But this new system, which may for distinction be called the "hole and corner" system of gas testing, finds favor with the committee; they consider it affords a better guarantee to the consumer than the system of fixed testing places. It certainly affords much greater facilities for finding fault with the gas companies. And so steps are to be taken to obtain the sanction of Parliament for adding the new plan to the existing legal tests. The variations afforded by the tests named in the report are noticeable; in respect to each company a range of two to three candles is recorded. No corresponding variation appears in the official returns.

From the above it appears that the portable photometer sometimes shows deficiency of some 10 per cent. or so against the gas; but this is nothing compared with what it does for the electric light. At the meeting of the Gas Institute, London, 1882, Mr. W. Sugg gave in the course of a paper entitled: "The Application of Gas to the Lighting of Open Spaces and Large Buildings," some interesting results of observations with a portable photometer on the various electric lights then in use in the city of London, taken *in situ*, and these results showed that only a portion of the nominal illuminating power was actually given out in practice, a nominal 2,000-candle light only actually furnishing 400 or 500 candles, and so on. Mr. C. E. Jones, of Chesterfield, recently read, before the Midland Association, an interesting paper on "Progress in Developing the Illuminating Power of Gas," and he included the results of observations *in situ* on some reputed 2,000-candle arc lights. The *best result obtainable* was 386 candles; others gave 289, 215, and 195 candles respectively. So it is much to be regretted that the Metropolitan Board had not obtained their portable photometer at the time when the electric lights were about, as it appears that the results of a few observations on "the light of the future," taken *in situ*, would have been interesting.

A report on the application for Parliamentary powers, in respect to gas and water supply, and to electric lighting, which will be brought before Parliament during the ensuing session, has just been issued by the Board of Trade. It sets forth that 45 bills and 17 applications for provisional orders, relative to gas and water supply, have been presented. There is only one application under the Electric Lighting Act, and this is from the Chelsea Vestry, who desire to raise and expend £66,000 in carrying out the necessary works for supplying electricity in their parish. The falling off in respect to electric lighting is instructive. In 1883 there were 106 applications, involving a capital of no less than two and three-quarters millions sterling; last year there were only four, with a capital of £60,000; and this year there is only the Chelsea Vestry, who evidently desire to experimentalize on a very extensive scale. They had better put their £66,000 in a safe place at moderate interest, and it will suffice to pay their gas bills for lighting the streets for many years to come.

But I do not know whether the fate of the Colchester installation may influence the Chelsea vestryman at all, since, before applying for the above powers, their surveyor (Mr. G. H. Slayton, Assoc. Mem. Inst. C.E.) visited Colchester for the purpose of examining and reporting upon the state of affairs after a three months' trial of the light, and also as to its future prospects; and that gentleman presented a succinct report stating that the practicability of house to house electric lighting had been successfully demonstrated, and that the light might reasonably be deemed a luxury, seeing that at the price at which it was supplied (½d. per lamp per hour) the price was equivalent to 33 per cent. more than the gas. As the price of gas at Colchester is 4s. 6d. per 1,000 cubic feet, this would be equivalent to about 6s. per 1,000 cubic feet for gas. The illuminating power of the ordinary incandescent lamp ranges (in my judgment) from 10 to 16 candles; so, to allow a liberal margin, we may reckon one lamp for one hour as equivalent to 3 cubic feet of gas; and at the rate of 3 cubic feet for ½d. the cost of 1,000 cubic feet of gas would be about 14s. So it appears that the Chelsea gentleman would have been nearer the mark if he had added another 3, and said, "the price is equivalent to 333 per cent. more than the gas." But as I might be considered a prejudiced witness, it will be better to quote from the *Electrical Review*, and that paper says: "It appears that the electric light experiment has turned out an utter failure. This causes us no surprise, for we have on several occasions remarked that scarcely any other result could be expected from an installation in which the number of lamps probably never amounted to 500, while less than 2,000 cannot pay." The next paragraph touches the real cause of the failure, viz., the price; it is as follows: "The lamps used never apparently illuminated any other portion of the buildings supplied than the shops, the rate of supply, ½d. per lamp per hour, not being sufficiently tempting." From an account recently presented at a meeting of shareholders in the Electric Light Company, it appears that the capital invested in the Colchester undertaking was £7,400, the working expenditure, not including depreciation, was £1,218, and the receipts £395. The system used involved the use of storage batteries and incandescent lamps, so the wear and tear must have been large; and the actual cost of providing the light, without including the interest on capital, cannot be put at much less than £2,000. It was estimated that if the whole of the 250 houses included in the district supplied took a reasonable number of lamps, a profit of 14½ per cent. would have been earned; but how could any reasonable business man expect that any householder would be prepared to have the electric light all over his house at such a price. As it is, the company appear to have given up hopes of obtaining remunerative business, and are talking of winding up.

Some interesting information as to the cost of public lighting in some south coast towns was included in a report presented at a recent meeting of the Margate Town Council. In Margate there are 16 miles of streets, and these are lighted by 356 lamps, at an average distance of 80 yards apart, the average consumption per lamp being 5 cubic feet per hour, and the annual cost £1,382. Folkestone, with 26 miles of streets, has 704 lamps, which average 40 yards apart, and the annual cost is £2,841. Ramsgate has 29 miles of streets, lighted by 683 lamps, averaging 57 yards apart, at an annual cost of £2,080. There are 20 miles of streets at Eastbourne, and 700 lamps; the average distance apart is 50 yards, and the annual cost £3,757. In Hastings the lamps are 49 yards apart, 900 lamps being used to light 25 miles of streets, at an annual cost of £4,000. In the west end of London the average distance from lamp to lamp is 35 yards, and in the suburbs 44 yards. The towns above named are supplied with gas of about 16-candle power, at the following prices per 1,000 cubic feet: Ramsgate, 3s. 6d.; Folkestone, 3s. 3d.; Eastbourne, 3s. 9d.; Hastings, 4s.; Margate, 3s. 2d. It is only to be expected that statistics of the above character will differ considerably. The distance from lamp to lamp will be affected in a great measure by the total widths of the roads including footways; and also to some extent by the con-

tour of the roads, whether curved or straight, and by the number of crossings, etc. But after allowing for these, anyone who has casually visited several of our towns after nightfall will have recognized that a very great diversity of opinion appears to prevail as to the quantity of light requisite for the efficient illumination of a thoroughfare.

The gas stock and share market continues in a satisfactory position. Things appear to be quiet on the Stock Exchange, but prices are well maintained; at recent sales in the provinces the shares of provincial gas undertakings have without exception sold well, considerably over 200 per cent. having on many occasions been realized for shares entitled to 10 per cent. dividend. The products market continues very dull. There appears to be a better demand for sulphate, as indeed is usually the case at this season of the year; but prices keep about the same, viz., something less than £12 per ton. The market for tar seems to be in a similar condition, these being affected by the general quietness of trade in the country. But, as regards our main object, the demand for gas, I hear more satisfactory news. An increased demand appears to have been the general experience during the last two months, and, as a natural consequence, we may expect to see several important extensions carried out during the course of next summer. Already, at this early period of the year, gas exhibitions have been held in various towns, and others are announced; so this undoubtedly successful method of increasing the use of gas for cooking and heating may be expected to be as much in vogue during the forthcoming season as it was in 1884.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

It was not of Much Account after all.—The daily press correspondents amused themselves, on a certain date toward the middle of last month, by formulating accounts of how the people of Decatur, Ill., were obliged to do without gas illumination during two entire nights, and assigned as a reason therefor that a very serious explosion had occurred at the plant of the Decatur Gas Light and Coke Company. Of course it would be a serious matter to the Decaturites were they obliged to dwell in a night illumination consisting of the brilliancy supplied either by "Standard water-white" or "eight to the pound superfine, hard tallow;" and they would undoubtedly be fit subjects for sympathy on the part of those who were enjoying the rays emitted from a well-regulated burner in its combustion of carburetted hydrogen. However, we communicated with Mr. J. W. Butman, Superintendent of the Decatur Company, in regard to the extent of the supposed disaster at his plant, and his response thereto informed us that the story was made up out of the fact that, after midnight of the date reported, one of the purifiers "blew out." On account of the lateness of the hour the valves to city supply were closed—simply because Mr. Butman knew that many of the inhabitants (especially the storekeepers) allowed one or more jets to be kept burning during the night and early morning. No damage was done to anyone or anything.

Something from Louisville, Ky.—The opposition gas company at Louisville, Ky., began the delivery of gas to consumers with the first week in March. The old Louisville Company's alterations and extensions to plant have been completed and accepted, and the Board of Directors complimented the contractors upon the excellence of the manner in which the details of construction were carried out.

Chronicling Several Changes.—We have been advised of the following changes in Superintendency, etc., of the works named: Mr. N. W. Moore, formerly Superintendent of the Fairfield (Iowa) works, resigned that charge to take a similar berth at the Wyandotte (Kansas) Company's plant. Mr. Frank E. McMillin (nephew of E. McMillin) goes to Fairfield. Mr. C. D. Shreve resigned the Superintendency of the Sioux City (Iowa) works, and Mr. L. L. Kellogg, formerly Superintendent and Treasurer of Nebraska City plant, becomes Mr. Shreve's successor. Mr. John M. Murphy, late Treasurer of Sioux City Gas Company, becomes Superintendent and Treasurer at Nebraska City (Neb.) gas works.

Cheaper Gas for Troy, N. Y.—The Troy Gas Light Company (Mr. F. A. Sabbaton, Engineer,) has made a reduction of 50 cents per thousand cubic feet in selling price. The reduction took effect on consumption registered on and after April 1st. New net rate is $2.25 per thousand.

Bartlett, Hayward & Co. to Build the Holder.—Messrs. Bartlett, Hayward & Co., of Baltimore, Md., are to build the new holder (152 ft. 6 in. diam.) to be erected by the Nassau (Brooklyn, N. Y.) Gas Light Company. Messrs. Freel and McNamee are to do the tank construction.

Election of Directors.—At a meeting of stockholders of Equitable Gas Light Company, of New York city, held Tuesday, March 17, the following gentlemen were elected to serve on the Board of Directors: Messrs. Eugene Kelly, Jacob D. Vermilye, R. M. C. Graham, E. J. Jerzmanowski, E. N. Dickerson, jr., E. C. Benedict, J. Sloane, W. H. Gebhard, Jacob Bertschmann, Jerome B. Wheeler, Chas. F. Tag, Chas. M. Fry, and Samuel W. Boocock. Messrs. Fry and Boocock are new men in the Board.

Cheaper Gas for Sioux City, Iowa.—In a paragraph given above it is stated that Mr. L. L. Kellogg had recently assumed charge of the superintendency and treasurership of the Sioux City (Iowa) Gas Works; and he had hardly placed himself in working harness before the proprietors of the company enabled him to issue the following inaugural to the gas consumers of that city:

"In assuming the management of the gas works of this city I do it with the full hope that my dealings with you will be pleasant, agreeable, and mutually profitable. All complaints will have prompt attention, and it shall be the aim of both myself and the company I represent to give the citizens of this city the best possible service for the least possible money. Perhaps no other commodity that figures in your daily expenses has been so much reduced in price, during the last four years, as has been that of gas. The price is now much below that of many places in the State where the consumption is much larger. It is the intention of the gas company to rebuild a portion of the works this year, and to largely extend the lines of main pipe. Now, with a view of inducing a larger consumption of gas, and of affording more general consumption, the President of the company has authorized me to publish the following schedule of prices which will apply to all gas consumed from April 1st, 1885:

"For gas consumed, per 1,000 cubic feet, in any one calendar month:—All consumption under 1,000 $2.70; 1,000 but under 2,000, $2.60; 2,000 but under 3,000, $2.50; 3,000 but under 4,000, $2.40; 4,000 but under 5,000, $2.30; 5,000 but under 10,000, $2.25; 10,000 but under 25,000, $2.20; 25,000 but under 50,000, $2.10; when consumption equals 50,000 feet and over, $2.

"The gross price will remain at $3 per 1,000, and discounts will be made to the above prices when bills are paid upon presentation."

Pretty good sort of people you are with, Brother Kellogg, when they allow you to "inaugurate" after the above fashion, and loudly proclaim the establishment of a "tariff for revenue only." When Mr. Emerson McMillin obtained a controlling interest in the Sioux City Company (which that gentleman did in 1881) gas was selling, or rather the gentlemen previously in charge were trying to sell it, at $4 per 1,000. "Mac" has not experienced any very great difficulty in running the consumption up to a point where it has become an imperative necessity to increase the capacity of the plant. That he is a firm believer in selling gas cheaply is best borne out by pointing to the prevailing rates at Columbus, Ohio, where he also "rules the roost." Then attention might further be called to other points where he acts as the "man at the helm."

Making the New Orleans (La.) Taxpayers Sweat.—New Orleans usually basks in a temperature pretty near akin to that of perpetual summer, and bearing this in mind, one would not be apt to wonder that its residents should look upon an occasional outbreak of perspiration with rather an indifferent state of feeling. Still that is not the sort of "sweating" which is alluded to in this "item's" headline. Far from being in a moist condition as to the physical pores is the present condition of the New Orleans ratepayer to be attributed. His wallet is "sweating"—or being reduced in substance—all on account of the fact that he has chosen to represent him in the City Council about as graceless a set of scamps as was ever gotten together. In the first place, the Council has been itching for about a year to put through some sort of a general electric street lighting scheme. Its members have time and again broken faith with the New Orleans Gas Light Company; the provisions of the contract between the city and the company have been grossly violated, and, to cap the climax, they would not pay the company for the services that it had performed. All this wretched business, looking at it in a perfectly fair light, would seem to have been carried on simply for the purpose of forcing the gas company to shut off the supply to the city, and thus enable the Councilmen, under cover of the ill feeling so engendered, to achieve the electric lighting job they have so pertinaciously clung to. So far their scheme has succeeded. The New Orleans Company refused to furnish gas, and the city was left in darkness—at least such is the information we get from what appears to be a trustworthy source—and now the city is to be lit with electricity. As a sample of what these Councilmen may be trusted to accomplish before the end is reached we might just here state that they promised to light the outlying districts of the city (or the sections hitherto illuminated with oil lamps) at the same cost as before obtained. The amount available for oil lighting, according to balance in yearly budget, was about $17,000; but the "representatives" have already located 34 towers, the maintenance of which will involve the certain expenditure of $34,000, while it may also be asserted that the "locating" has but now rightly commenced. The New Orleans *Picayune*, in adverting to this matter, says: "Our readers can now comprehend more fully the real motive which actuated

many members of the Council in carrying on the contest with the gas company to a point which has left the city in darkness, and our people at the mercy of thieves, burglars and footpads." Will Mr. Victor Vallois, Secretary of New Orleans Gas Light Company, do us the favor of forwarding positive information in regard to this matter?

When His Term Expires.—The term of office of Mr. F. Erhardt, now "New York State Inspector of Gas Meters," expires with midnight of April 18. Already are the political heelers "hot on the scent" for the position. It is not likely that anything we could say on the question will alter the determination that the politicians will arrive at; but we will take the opportunity to remind Governor Hill and the Senate confirming power that, while a man may be pretty well posted in the matter of bulldozing voters, it does not follow that he would make a good meter inspector. Perhaps the "Gas Consumers Association" could be induced to represent the importance of this matter before the Governor, although it is well nigh useless to expect the members of that "august assemblage" to take any steps which would be of real value to anybody.

A Reduction.—The Warsaw (N. Y.) Gas Light Company recently reduced its selling rates. We have not been advised as to the schedule made.

Striking Gas Coal Miners.—The miners operating pits of the New York and Cleveland Gas Coal Company demanded that their remuneration be increased to three cents per bushel. The Company refused to accede to the request, and the mines were shut down on March 23.

The Equitable (N. Y.) Gas Company's Officers for Ensuing Year.—In completion of the "item" (see forward) recounting election of Equitable Directors, it is noted that the Board organized with the selection of R. M. C. Graham as President; E. J. Jerzmanowski, Vice-President; J. D. Vermilye, Treasurer. The new Executive Committee includes Messrs. Kelly, Vermilye, Sloane, Benedict, and Boocock.

Suing a Gas Company on the Ground that an Escape of Gas Caused the Death of Shade Trees.—Mrs. Sarah King, who resides in the premises known as 385 Cumberland street, a very aristocratic locality in the "City of Churches," on date of March 11th brought suit against the Brooklyn (N. Y.) Gas Light Company to recover damages in $50. The plaintiff asserted that company's employees, while engaged in laying a gas main, passing in front of her premises, had performed the operation with such negligence that the conduit, when put to the test of distribution, allowed gas to escape and permeate the soil to such an extent as to destroy two valuable shade trees, in the possession and observation of which she had often extracted much comfort. Judge Courtney, the clever judicial gentleman before whom the case was tried, was rather staggered when the testimony was "all in;" and well he might be after the examination of Mr. Henry Botcher (can't help wondering if he is related to Bottsford) had been concluded. Mr. Botcher, as an "expert" gardener, testified (he was "retained" by Mrs. King) that no one except the owner of the premises could put a value on the trees. Intrinsically he admitted that they were worth "about" $10, but the real value was known only to Mrs. King—and, "by our faith," she put it high enough. Fifty dollars for ten dollars' "worth of trees" must have made Judge Courtney and President Armington incline to the view that the lady was seeking after "exemplary damages." Counsel for company moved for a dismissal on the point that the trees grew on a public thoroughfare and were public property. Decision was reserved for one or two days, at the end of which time Judge Courtney made short work of Mrs. King's arborical case by promulgating an opinion that while "she proved that the trees were dead, and that gas was escaping from the street main, she failed to prove that the leakage of gas had killed them."

Now it is the Edison Meter.—Much amusement has recently been caused in gas circles in New York city over a complaint made by the proprietors of a banking and brokerage firm doing business at 64 Broadway. Having been "robbed" by the New York Gas Light Company (so the head of the banking firm pleasantly put the case in the summer of 1884) long enough, he determined to save money by putting in the Edison light. August last the connections were made, and the electric illumination cost about $5 for the first month's trial. That was a trifle less than the gas formerly cost. October's bill was "bigger by a dollar;" November beat October by a dollar; December outpaced November; January account was $8.21; February, $8.67. Too high for the banker. He said that all the movable Edison lamps were removed one day after receipt of February statement, and gas was again laid on to the premises. At about the right date in March along came a bill from the Edison Company (from Feb. 18 to March 19), amounting to $9.29; and the financier naturally enough refused to pay it. We have heard so many "tough" stories told about gas meters and gas bills, and with not a particle of truth in them, that we will not say much about this particular case—closing our reference to it by stating that the gas company is now doing the lighting at 64 Broadway. But we will mention a circumstance that does not speak volumes in favor of Mr. Edison's "patent meter," the truth whereof we can vouch to. A jobber in druggists' glassware and sundries, in the person of Mr. William Cagger, does business at No. 100 William street, this city. Mr. Cagger's storerooms are situated on second and third floors of this building. It is one of the old style of construction; the floor space is long and narrow, and the ceilings are low. There is no light shaft, and the only natural lighting means provided is that gained through narrow windows at front and rear. As a consequence artificial illumination must be more or less resorted to during the entire length of business hours. In the summer season the constant burning of one or two six feet per hour gas flames is not a particularly desirable practice to follow, having reference solely to the personal comfort of those whose duties compel them to remain in places like unto those above described. Mr. Cagger thought that he would make a trial of the Edison light, and the connections were made, lamps were put up, a meter was put in, and the lights were turned on. While he confessed that the illumination was not so good as that formerly obtained from the gas, he was inclined to believe that the temperature conditions were ameliorated. When the Edison company's agent was asked to supply the light he (the agent) made inquiry as to the number of lights that would probably be used, and the length of time they would be employed, etc. It seems to be a chronic failing with purchasers of artificial light to assert that their theoretical needs are far below their practical requirements, and Mr. Cagger proved no exception. His estimate of the number of hours of burning was put at a very modest figure. At the end of the first month, after the meter had been taken, the bill came in, and it rather proved to the delighted dealer in druggists' sundries that electric illumination was very, very cheap. The second month's bill was equally reasonable; but the collector inquired from Mr. Cagger whether (two lamps were in action) he "kept those burners agoing all through the day." Mr. Cagger answered: "Oh! not altogether." Two days therefrom Mr. Cagger was a trifle surprised at the conduct of a visitor to his storerooms. The stranger ran up the stairs, opened the half-glass door leading to the main room, poked his head in, gave a hurried look at the electric lamps (they were doing duty), and vanished. In a couple of days the same thing happened; and was repeated on a third and fourth occasion. At the fourth onset Mr. Cagger, being near the door when the "inspector" happened along, interrupted his departure with a shout of, "Say! what do you want?" In response he was greeted with, "Never mind; I have *seen* all that I *want*." Mr. Cagger's next bill for electric illumination was about 12 per cent. higher than the average run of the gas company's prior charges. Now we submit it looks as though this case does not offer much evidence as to the reliability of that famous measuring instrument devised by the erstwhile wizard of Menlo Park.

Reducing the Price of Gas in Kingston, Canada.—Mr. John Kerr, Manager of the City of Kingston Gas Light Company, on date of March 25, 1885, was authorized by his Board of Directors to give notice to the consumers that on and after date of April 1st the following net prices would prevail:

A consumption under 5,000 feet per quarter		$2.50	per M.
"	between 5,000 and 10,000 feet per quarter	2.40	"
"	" 10,000 and 15,000 " "	2.30	"
"	" 15,000 and 25,000 " "	2.20	"
"	" 25,000 and 40,000 " "	2.10	"
"	upward of 40,000 feet per quarter	2.00	"

We believe the prior net rate was $3 per thousand, and the above schedule will be noted as granting a good round concession to all classes of consumers. The gentlemen who have invested capital in the Kingston Company have been satisfied for years back with the low return of 5 per cent. for the use of their money, and so the charge of "excessive dividends" can hardly be urged against them by the "oppressed consumer." One most unfavorable circumstance connected with the company's operations is the fact that main excavations have to be made, to a very great extent, through solid rock. If the increased output ensuing as a consequence of this reduction be such as to justify the step, Mr. Kerr promises to attempt more experiments of a like nature.

A Narrow Escape.—J. McLean, a lineman in the employ of the Toronto Electric Light Company, had an agonizing experience at an early hour on the morning of March 24. While another employee of company was lowering the lamp at corner of King and Princess streets to replace the carbons, the hoist rope broke and the apparatus fell to the ground. The conduit wire was severed, and all the lights on the circuit were extinguished. News was sent to shops of company, and McLean was detailed to repair the damage. Arriving at the wreck McLean seized the ends of the severed wire, and was instantly thrown to the ground. He was badly burned about the hands, and remained for several hours in an unconscious condition. He will recover. The accident was explained by the fact that after the current had been shut off from ruptured circuit some blunderer at the dynamo station re-established the connection.

THE AMERICAN GAS LIGHT JOURNAL

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Manager—C. E. SANDERSON.

THURSDAY, APRIL 2, 1885.

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APRIL 2.

☞ All communications will receive particular attention.

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	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	83	84
Central	440,000	50	60	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	107	109
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	112	113
Mutual	3,500,000	100	126	128
" Bonds	1,500,000	1000	104	106
Municipal, Bonds	750,000		107	110
Northern	125,000	50	—	80
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	131	133
Citizens	1,200,000	20	84	86
" S. F. Bonds	320,000	1000	106	110
Fulton Municipal	3,000,000	100	151	153
" Bonds	300,000		104	108
Peoples	1,000,000	10	80	82
" Bonds	290,000	—	105	110
" "	250,000	—	90	95
Metropolitan	1,000,000	100	96	—
Nassau	1,000,000	25	121	123
" Ctfs	700,000	1000	92	94
Williamsburgh	1,000,000	50	132	135
" Bonds	1,000,000	—	106	108
Richmond Co., S. I.	300,000	50	64	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	80	85
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	103	115
" " Bonds	124,000	—	105	110
Chicago Gas Co., Ills	5,000,0000	25	128	132
Peoples G. L. & C. Co., Chicago, Ills			8	12
Cincinnati G. & C. Co.			180	182
Consolidated, Balt.	6,000,000	100	60	61
" Bonds	3,600,000		101	103
Central, S. F., Cal.			—	58
Capital, Sacramento, Cal.			36	—
Hartford, Conn	750,000	25	123	129
Jersey City	750,000	20	145	—
Laclede, St. Louis, Mo.	1,600,000	100	88	—
Louisville, Ky	1,500,000	50	95	100
Montreal, Canada	2,000,000	100	181	182½
New Haven, Conn		25	166	170
Oakland, Cal.			29	30
Peoples, Jersey City		—	45	50
" " Bonds			—	—
Paterson, N. J.		25	90	—
Rochester, N. Y.		50	75	80
Washington, D. C.	2,000,000	20	190	200
Wilmington, Del.		50	188	—
Yonkers		50	90	92
St. Louis, Missouri	600,000	50	—	—
San Francisco Gas Co. San Francisco, Cal.			58	59
Havana (Cuba) Gas Co.	3,000,000	100	8	—
" Bonds	550,000			

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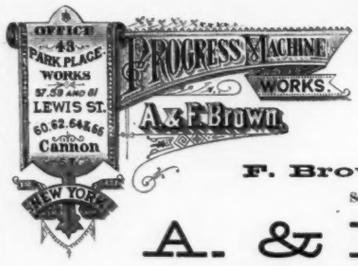

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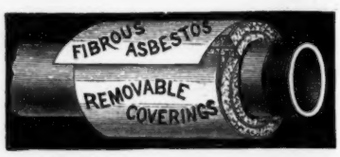

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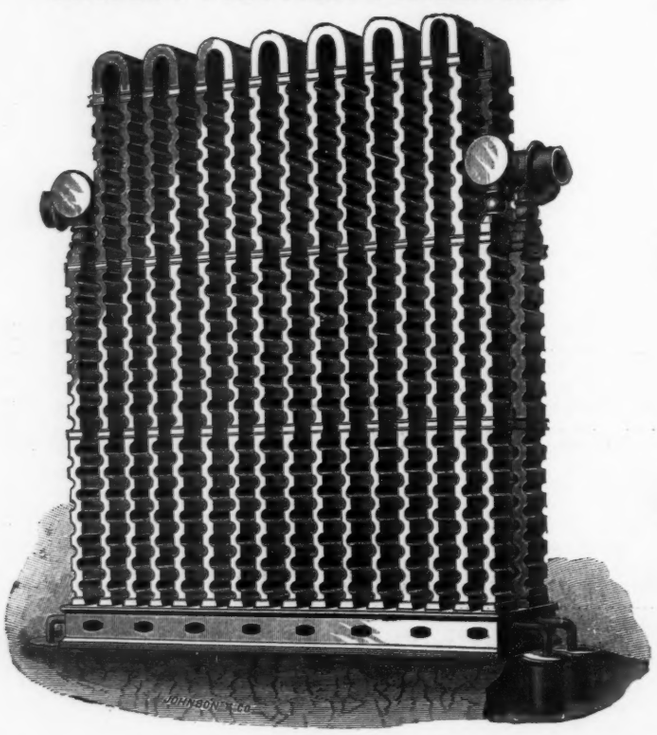

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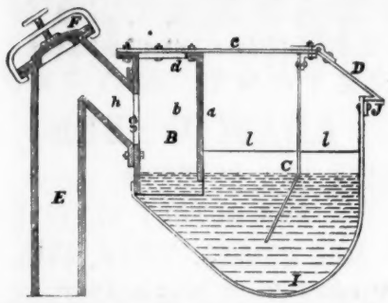

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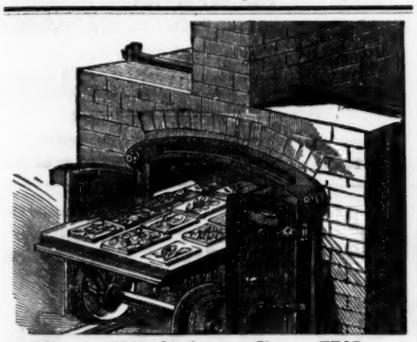

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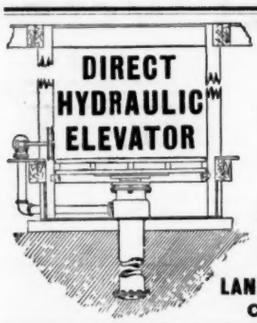

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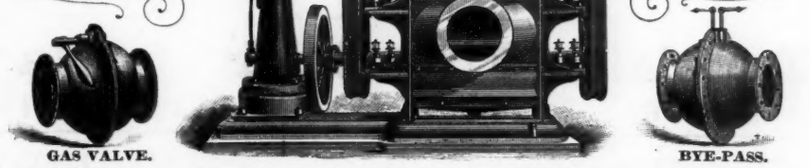

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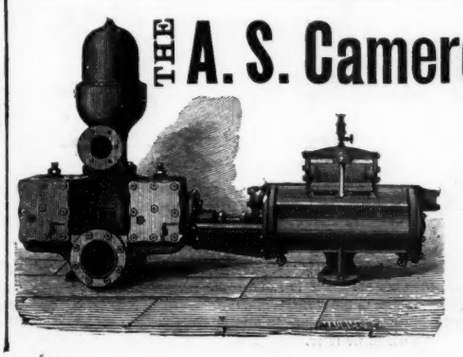

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Clay Retorts and Settings.

BLOCKS & TILES

Of every Shape and Size to Order.

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Our immense establishment is now employed almost entirely in the manufacture of

MATERIALS FOR GAS COMPANIES.

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. Ou customers are in almost every State of the Union, to all of whomjwe refer.

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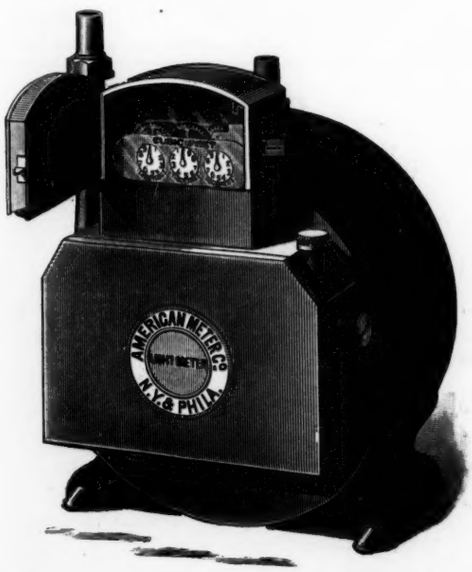

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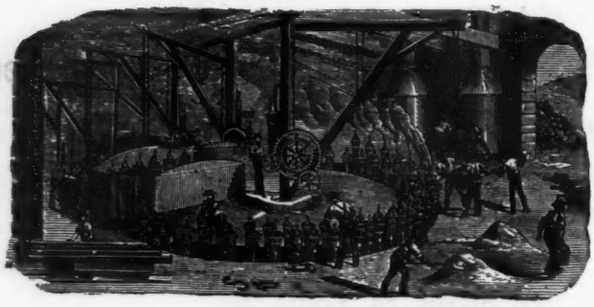

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FROM TWO TO FORTY-EIGHT INCHES DIAMETER.
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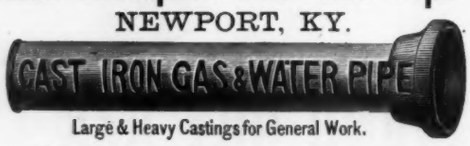

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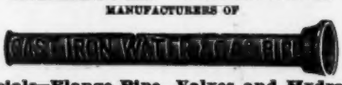

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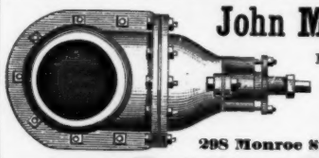

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1st. It is simple, strong, and easily used.

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Price, $1.25. Sent either by express or mail, at directed. By mail the postage will be 20 cents, which will be added to the price of the Binder.

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Siemens's Regenerative Gas Burners,

For Lighting and Ventilating.

THE CHEAPEST, PUREST, AND MOST BRILLIANT OF ALL GAS LIGHTS.

Superior to the Electric Light in Economy, Beauty, & Steadiness.

SPECIALLY ADAPTED FOR LIGHTING HALLS, FACTORIES, OPEN SPACES, ETC.

Numerous Tests made by various Gas Companies in the United States show an Efficiency of Ten Candle Power per Cubic Foot of Gas.

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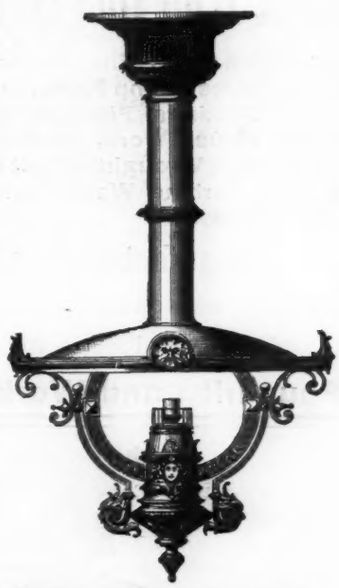

THE SIEMENS REGENERATIVE GAS LAMP COMPANY,

SOLE MAKERS FOR THE UNITED STATES,

N. E. Cor. 21st. St. and Washington Av., Philadelphia, Pa.

THE "STANDARD" WASHER-SCRUBBER,

KIRKHAM, HULETT & CHANDLER'S PATENT.

Total Capacity per 24 Hours of "Standard" Washers Ordered During the Following Years.

1877	4,000,000	cubic feet.
1878	4,750,000	"
1879	24,545,000	"
1880	42,967,500	"
1881	36,462,500	"
1882	39,800,000	"
1883	57,735,000	"
1884	26,177,500	"
Total	235,937,500	cubic feet.

Total Number and Capacity per 24 Hours of "Standard" Washers Erected and in Course of Erection in the Several Countries

	Number.	Cubic Feet per Day.
Great Britain	151	157,070,000
Western Hemisphere	38	39,337,500
Australia	18	12,150,000
New Zealand	2	650,000
France	6	4,550,000
Belgium	8	5,420,000
Germany	16	8,200,000
Holland	4	4,160,000
Denmark	1	150,000
Russia	2	3,500,000
Spain	1	350,000
India	1	400,000
Total	248	235,937,500

THE CONTINUED POPULARITY

Of these Machines

Will be recognized from the following extracts from letters from representatives of some of the companies having them in use:

TOLEDO GAS LIGHT AND COKE CO., TOLEDO, OHIO, Nov. 25, 1884.

GEO. SHEPARD PAGE, Esq.:

Dear Sir—Replying to your kind favor of 21st inst., I would say that the "Standard" Washer-Scrubber is doing work that is entirely satisfactory to us. During the summer I had 12-oz. liquor; but since cool weather commenced I have been having from 18 to 23-oz. liquor, just as we would elect. There is not a trace of ammonia passing the Scrubber that a test of reddened litmus or yellow turmeric paper would indicate. The machine, in my opinion, is all that could be desired as a means for removing all the ammonia from the gas.

Very respectfully,

C. R. FABEN, Jr.,
Superintendent.

"Standard" Washers Ordered During the Current Year.

	Cu. Ft. per Day
Anneberg Gas Co	200,000
Bombay Gas Co	400,000
Brussels Co	1,250,000
Chemnitz Gas Co	1,000,000
CITIZENS GAS CO., BUFFALO	750,000
Coke Works in Zabre, Ober-Schlesien	1,500,000
Cokerei der Friedenshutte, Upper Silesia	500,000
Dumfries Corporation	250,000
Dunedin Gas Co., New Zealand	400,000
King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
LOUISVILLE GAS CO	1,500,000
Numea Gas Co	100,000
PITTSBURGH GAS CO	1,500,000
PORTLAND GAS CO., Oregon	562,500
SAN FRANCISCO GAS CO	4,000,000
Sheepbridge	40,000
ST. LOUIS GAS CO	2,000,000
Sydney Gas Co	2,500,000
WASHINGTON, D. C. GAS CO	2,000,000
Whitchurch Gas Co	175,000
Total	26,177,500

GEO. SHEPARD PAGE, No. 69 WALL STREET, NEW YORK,

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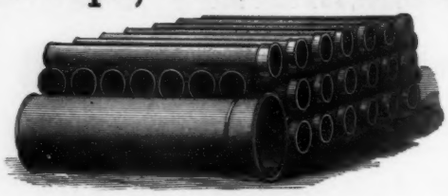
R. D. WOOD & CO.,

400 Chestnut Street, Phila., Pa.

Cast Iron Gas & Water Pipe, Water Machinery & Gas Apparatus

Cast Iron Pipe, Fire Hydrants, Eddy Valves, Lamp Posts, Large Loam Castings, Flanged Pipe, Sugar House Work, Iron Roofs and Floors, Wrought & Cast Iron Tanks, Turbine Water Wheels and Pumps.



Gasholders, Lime Trays, Center Valves, Purifiers, Bench Work, Exhausters, Condensers, Governors, Scrubbers, Gas Valves Station Meters, Cast Iron Pipe Fittings.

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Estimates and specifications furnished for erection of new works or the extension or alteration of old ones.

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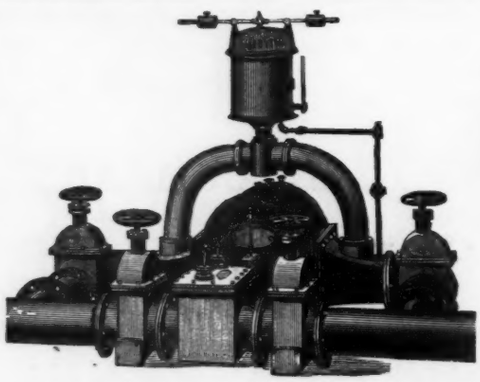

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Machinery & Apparatus for Gas Works

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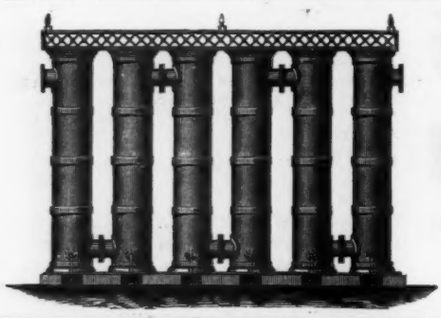
Mackenzie's Patent Rotary and Steam Jet Gas Exhausters, Governors, Compensators, Condensers, Washers, Scrubbers. Isbell's Patent Automatic Street Pressure Governor, Gas and Water Valves, Hydraulic Main Dip Regulator, Bench Castings, etc. Purifying Boxes and "Standard" Scrubbers. Isbell's Patent Self-Sealing Retort Doors.



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Gas Apparatus,

INCLUDING

Condensers of various styles, Scrubbers, Holders, Purifiers, Castings for Retort Houses, Etc.

ALSO STEAM ENGINES AND BOILERS.

Plans, Specifications and Estimates Furnished.

SOUTHWARK FOUNDRY AND MACHINE COMPANY,

Successors to MERRICK & SONS. Established in 1836.

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Single and Telescopic Gasholders,

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Washers, Scrubbers, Condensers, Purifiers,

And all apparatus necessary for the construction of improved new gas works and in the extension of established works. Also manufacturers of

Gas Engines, and of all descriptions of Steam and Hydraulic Machinery, and of Boiler and Tank Work.

Plans, specifications, and estimates furnished promptly on application.

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Builders of Gas Works,

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We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

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MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS-WORKS.

BENCH CASTINGS from benches of one to six Retorts each.

WASHERS: MULTITUBLAR AND AIR CONDENSERS; CONDENSERS; SCRUBBERS (wet and dry), and EXHAUSTERS for relieving Retorts from pressure.

BENDS and BRANCHES of all sizes and description.

FLOYD'S PATENT MALLEABLE RETORT LID.

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and everything connected with well regulated Gas Works at low price, and in complete order.

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Plans, Specifications, and Estimates furnished.

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Single Lift and Telescopic

GASHOLDERS.

Built, 1884:

Altoona, Pa	Capacity,	160,000 cubic feet.
Pittsburgh, Pa	"	250,000 "
" "	"	220,000 "
Bellaire, Ohio	"	50,000 "
Youngstown, Ohio	"	60,000 "
Canton, "	"	60.000 "
Akron, "	"	80,000 "
Xenia, "	"	10,000 "
Adrian, Mich	"	65,000 "
Ypsilanti, Mich	"	25,000 "
Muskegon, "	"	70,000 "
South Bend, Ind	"	70,000 "
Anderson, "	"	20,000 "
Plainfield, "	"	10,000 "
Springfield, Illinois	"	100,000 "
Evanston, "	"	50,000 "
Freeport, "	"	35,000 "
Elgin, "	"	60,000 "
Sheboygan Wis	"	20,000 "
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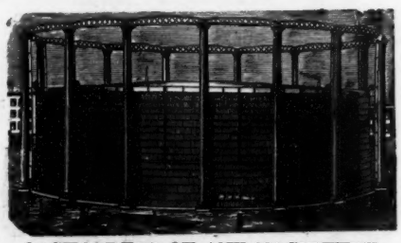

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IRON ROOFS, BRIDGES, LAMP POSTS,

Water and Oil Tanks, Coal Elevator Cars,

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And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works. Rolling Mill Machinery and Heavy Castings a Specialty.

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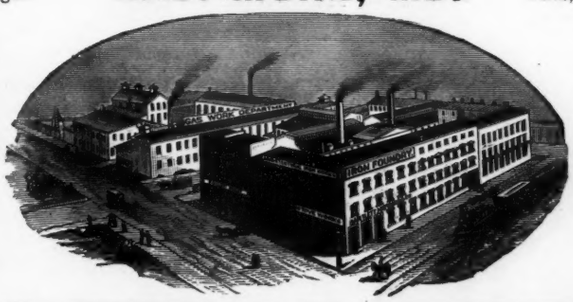

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Single or Telescopic, with Cast or Wrought Iron Guide Frames.

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JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

General Sales Agents.

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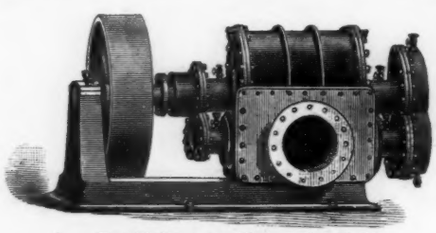

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